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Skeptical Inquirer

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Skeptical Inquirer September/October 2018 | Vol. 42, No. 5

FEATURES

32
The God Engine
Belief in the supernatural develops as a natural consequence of the way our brains work, so it should be no surprise that religion is both pervasive and enduring.
JAMES E. ALCOCK

39
From the Spectral to the Spectrum: Radiation in the Crosshairs
Public attitudes about radiation, shaped by a rich history of mythology from biblical times to the modern events of Chernobyl and Fukushima, impact personal lives and decisions, but they also have global existential implications.
JEANNE GOLDBERG

44
Multi-Level Menace
Multi-level marketing companies use subtle influence techniques to capture and influence recruits—and you are at risk.
DENISE SUTHERLAND

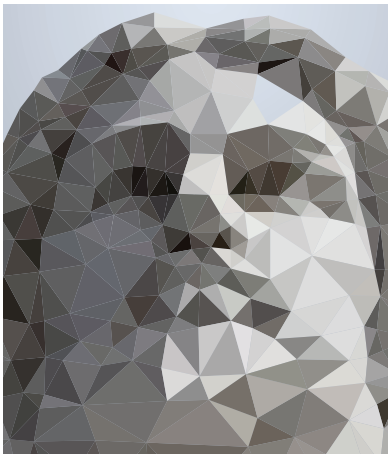
48
I've Got Algorithm. Who Could Ask for Anything More?
The news has been filled with discussions of the so-called algorithms of Facebook and other software giants. Originally, the word *algorithm* had a precise meaning, but more recently it has been used to elicit undeserved respect—and perhaps to avoid deeper scrutiny.
PETER KASSAN

52
Biological Reasons Young-Earth Creationists' Worldwide Flood Never Happened
Like the geological evidence, biological evidence demonstrates that a worldwide flood never happened 4,350 years ago, as young-Earth creationists believe.
LORENCE G. COLLINS

SPECIAL REPORTS

10
On the Set of *Cosmos*'s Season Two
KENDRICK FRAZIER

13
Ghostly 'Black Monk' or Random Tourist?
KENNY BIDDLE



COMMENTARY

16
We Need a Paradigm Shift in Science Advocacy
GREGG DAVIDSON, CAROL HILL, AND KEN WOLGEMUTH

COLUMNS

FROM THE EDITOR
Why Belief Is So Powerful 4

NEWS AND COMMENT
Homeopathy Challenge: German Skeptics Offer 50,000 Euros If Test Is Passed / Some Good News on Climate: A Big Shift among TV Weathercasters / Crucifixion Evidence Debunks Turin 'Shroud' / Small Town Virgin Mary 'Miracle': Olive Oil 5

INVESTIGATIVE FILES
Outside the Box: Solving Diverse Mysteries
JOE NICKELL 18

NOTES ON A STRANGE WORLD
A Telepathy Investigation
MASSIMO POLIDORO 21

BEHAVIOR & BELIEF
Why Are Millennials Turning to Astrology?
STUART VYSE 24

REALITY IS THE BEST MEDICINE
The Care and Feeding of the Vagina
HARRIET HALL 28

SKEPTICAL INQUIREE
Caught Between the Possible and the Paranormal
BENJAMIN RADFORD 30

NEW AND NOTABLE 60

LETTERS TO THE EDITOR 62

THE LAST LAUGH 66

REVIEWS

An Early 'Monster' with an Older History
TERENCE HINES 58
The Secret History of the Jersey Devil
by Brian Regal and Frank J. Esposito

The Case That CAM Is Unethical
HARRIET HALL 59
More Harm Than Good? The Moral Maze of Complementary and Alternative Medicine
by Edzard Ernst and Kevin Smith

Climate Fundamentals: NOVA's 'Decoding the Weather Machine'
DAVID MORRISON 61
NOVA, PBS, "Decoding the Weather Machine," broadcast.

This Is Your Brain on Social Media
BENJAMIN RADFORD 62
Think Before You Like: Social Media's Effect on the Brain and the Tools You Need to Navigate Your Newsfeed
by Guy P. Harrison

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[FROM THE EDITOR

Why Belief Is So Powerful

For scientists and scientific skeptics, the most powerful word is *why*. Why is nature like it is? Why do people behave they way they do? Wondering why initiates all inquiry and leads to all new knowledge. In the Skeptical Inquirer we have articles that investigate and articles that explain. Investigations may find new answers to mysteries. Explanatory articles help us understand why things are the way they are.

Psychologist James E. Alcock's cover article in this issue, "The God Engine," is an exemplary form of explanatory writing. The question he asks, and cogently answers, is: Why is religious belief so pervasive, so powerful, so important, so resistant to criticism? It's a question all thoughtful people ponder, but to science-minded people and freethinkers it has occupied a big share of our time and energy.

Alcock, who has been associated with the modern skeptical movement from the beginning, here steps back and takes a psychologist's long view. No single reason accounts for all of belief's attractions, but they must stem from the natural ways our brains work. As he says, "Belief in the supernatural … is a product of a metaphorical 'God Engine' that endows it both with significant power over the lives and people and the groups to which they belong and with strong resistance to change. In other words, a number of automatic processes and cognitive biases combine to make supernatural belief the automatic default."

We are born magical thinkers; we are born agency detectors. We develop mental processes in childhood that lead to dualism (mind and matter are separate) and to the perception that things happen for a reason, which eventually leads to thinking that some extraordinary intelligence is guiding things. The reality testing we do insulates some concepts from scrutiny. We make wishes (similar to praying). We dream (which seems another plane of reality). We have transcendent emotional experiences. And then our cultures teach and reinforce belief in myriad ways, providing their own appealing explanations for everything from how the world was created to what happens to you after you die. You can see why belief is so powerful and resilient. Alcock's inquiries go far beyond just god-belief to all forms of belief, which he has just published in a comprehensive book with that simple title, *Belief*. I heartily recommend it.

Geologist Lorence G. Collins returns to our pages with another take on why one particular religious belief has no support in empirical reality. "Biological Reasons Young-Earth Creationists' Worldwide Flood Never Happened" is a natural follow-up to his earlier well-received SI article (March/April 2018) on twenty-one *geological* reasons Noah's worldwide flood never happened.

Jeanne Goldberg, who wrote our cover article "The Politicization of Science" a year ago, now writes of our fears of radiation. A radiologist herself, she takes a long, cultural view. She describes and laments our many misconceptions about radiation and explains why these fears and superstitions endanger us all.

And we welcome a writer new to our pages, Denise Sutherland, who explains what multi-level marketing schemes are all about and how easy it is, even for smart, skeptical, people, to be taken in by them.

Explaining the world doesn't always tell us what we wish. But skeptics and science-minded people tend to be realists and usually appreciate that fact. I trust that is so here.

—Kendrick Frazier

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Homeopathy Challenge: German Skeptics Offer 50,000 Euros If Test Is Passed

Kendrick Frazier

As most scientists and skeptics know, homeopathy is a sham medical practice with no scientific validity that is nevertheless highly popular worldwide.

In the United States, the Federal Trade Commission (FTC) and the Food and Drug Administration (FDA) have both been putting some pressure on manufacturers of homeopathic remedies.

The Center for Inquiry, which includes our Committee for Skeptical Inquiry, has been instrumental in pushing those agencies to act (see, e.g., "Homeopathy 'Unsupported, Ineffective, Dangerous': CFI Testimony to FDA," SI, July/August 2015; "Homeopathy Is a Sham," by CFI Legal Director Nick Little, August 1, 2017, on csicop.org; "FDA to Regulate Some Homeopathic Products; CFI Hails Move," SI, March/April 2018; and "FDA Has Duty to Crack Down on Homeopathic Fake Medicine, says Center for Inquiry," SI, July/August 2018).

In fact, as we were in layout, CFI announced a major lawsuit against CVS pharmacies for fraud in marketing sham homeopathic remedies (see https://centerforinquiry.org/press_releases/cfi-sues-cvs/). More on that in our next issue.

Homeopathy is even more popular in Europe than in the United States and especially so in Germany. There, full-fledged doctors and layman-practitioners alike deploy and promote homeopathic remedies, and they've found ways to get health insurance companies to reimburse for homeopathic treatments. Skeptic arguments against homeopathy draw quick opposition from homeopathy's defenders, few of whom are versed in scientific thinking or the way research works.

Scientific skeptics in Germany have found that arguing that homeopathy has been rejected by science has not been convincing to the practice's users and defenders.

So GWUP, the German branch of the international skeptics movement, has announced a new kind of challenge to homeopathy. They decided to drop the "science paradigm" and "open their minds," as requested by homeopaths. They issued this challenge following GWUP's annual meeting in Cologne, Germany:

Norbert Aust

GWUP, the German branch of the international skeptics movement, has announced a new kind of challenge to homeopathy.

> We are willing to pay the amount of 50,000 Euro (fifty thousand Euro) to the first individual or group that is able to identify homeopathic preparations in high potency and to give a detailed description on how this can be achieved reproducibly.

Homeopaths may use their own methods, whether recognized in science or not, to disprove one of GWUP's major points in criticizing homeopathy, namely that all homeopathic preparations in high potency are identical and thus incapable of triggering specific healing effects.

"This protocol is as accommodating to homeopathic understanding as can be," Norbert Aust of GWUP's homeopathy working group said in announcing the challenge.

To start, the participant is to name three different homeopathic remedies of his choice that he thinks he could distinguish best. GWUP will assign a sworn-in public notary in Germany to prepare twelve coded bottles each containing one of the three remedies. The material will be supplied by the vendor directly to the notary, and GWUP is to provide a randomized list established by throwing a pair of dice.

GWUP has a set of detailed guidelines for the test, available on its English-language website at https://www.gwup.org/current-tests, but in short it goes this way: In two rounds GWUP will supply a set of twelve coded bottles to the participant. Each bottle contains one of three remedies in high potency the applicant specified to be able to identify.

When at least eleven of the twelve bottles are correctly identified and when the participant supplies a description of his approach, the first half of the test is successfully resolved. For the final part, the notary will provide another set of twelve bottles with either the same remedies but supplied from another vendor or different remedies supplied from the same source as before. If the participant once again correctly identifies eleven of the twelve contents and it could be verified that the participant deployed the method described in the first step, then the participant is entitled to receive the prize.

Participants themselves define the time they need, a maximum of six

months after they receive the bottles. They may deploy any method they think best to accomplish the task. GWUP says it is ready to accept any method if it yields the correct result.

The mutually agreed upon protocol will be binding for both parties after the contract between the participant and GWUP is signed. Applications must come within two years of GWUP's public announcement of the challenge in May 2018, so no applications will be considered after April 30, 2020.

"GWUP invites individuals or groups that are interested to verify that we critics are wrong and want to show that the tenets of homeopathy might be right after all," GWUP's Aust said in a background statement about the challenge.

GWUP wants to show by this challenge that it is impossible to distinguish homeopathic remedies by any means and that this is not a question of not accepting some outlying methods that have no real scientific validity. The reason for the remedies to be indistinguishable is that they are identical save random contamination of the materials involved in production and the surrogate. The issue of "science paradigm" would be obsolete. Science is a well-honed method to evaluate what is real fact and what is not.

> If however somebody solves the task, this would be a scientific sensation, and GWUP would have a part in it. We would publish a report of this trial in some top scientific journal to trigger research [in] how the properties of material not present in the solution is nevertheless able to define its properties. Quite a number of Nobel Prizes would follow in due course and it would be an honor to be mentioned by the laureate as the institution who started all of this.

GWUP is asking skeptic organizations worldwide concerned with pseudomedicine to help spread word of the challenge. It specifically asks help in identifying homeopathic organizations so that GWUP can send them the challenge invitation.

For further information, see https://www.gwup.org/current-tests or contact Norbert Aust directly at aust@gwup.org.

Kendrick Frazier is editor of the Skeptical Inquirer.

Some Good News on Climate: A Big Shift among TV Weathercasters

David Morrison

The U.S. Federal government under the current administration is purging any discussion of climate change and global warming from its websites and trying to cut support for scientific research on climate. But public understanding is slowly improving, with the aid of many TV weathercasters (NBC, March 18, 2018). Eight years ago, the *New York Times* (March 29, 2010) described widespread opposition to the idea of global warming among forecasters on local television, based on a survey from George Mason University and the University of Texas. At that time, fewer than a third of these forecasters believed that warming was real and largely caused by humans, and a quarter agreed with the statement "Global warming is a scam." Almost none of them mentioned climate change in their daily weather reports. But times are changing.

As described in the new NBC report, many of the "friendly neighborhood meteorologists have rapidly evolved to not only accept climate change but to share the news with audiences in hundreds of U.S. television markets." This change is credited in part to Climate Central, a nonprofit organization that sponsors classes for meteorologists and provides climate graphics to TV stations. A George Mason University study reports a fifteen-fold increase in the number of stories on global warming on local television over the past five years. In a 2017 survey of weather broadcasters, it found that 95 percent agreed that climate was changing.

Many still hesitate to mention global warming in their weather reports, but this resistance is changing too. According to the NBC story, those who have discussed the links between extreme weather and global warming have had no pushback from the management of their local TV stations. The many examples in the past few years of drought-related wildfires in California, widespread floods in Texas, and increased frequency of large hurricanes have provided opportunities for these weather forecasters to link extreme weather with climate change.

Pope Francis has also been an outspoken critic of climate deniers. He recently stated: "Anyone who denies [climate change] should go to the scientists and ask them. They speak very clearly ... climate change is having an effect, and scientists are telling us which path to follow. And we have a responsibility—all of us. Everyone, great or small, has a moral responsibility." His remarks to a group of energy industry leaders were even more pointed. He told them that they should stop exploration aimed at developing new gas and oil fields, since success in limiting global warming depends on not burning the carbon reserves that remain underground. This is a position long advocated by former NASA climatologist Jim Hansen, but it has not yet received broad public discussion.

David Morrison is a NASA senior scientist and SI contributing editor.

Crucifixion Evidence Debunks Turin 'Shroud'

Joe Nickell

As if there were not already enough evidence debunking the Shroud of Turin—the historical record, a forger's confession, tempera paint, and multiple carbon-dating tests—now new evidence further discredits the authenticity of the reputed burial cloth of Jesus.

The new finding is the 2,000-year-old skeletal remains of a crucified Roman. It was reported on Live Science ("How Jesus Died: Rare Evidence of Roman Crucifixion Found" by Tom Metcalf, https://www.LiveScience.com/62727-jesus-roman-crucifixion-found.html). The June 4 article described examination of the bones (originally discovered in 2007 near Venice) as revealing a lesion together with an unhealed fracture located on one heel bone. The discovery is quite revealing because it is consistent with the only other apparent crucifixion wound known to archaeology.

That earlier discovery came in 1968 with the excavation of a Jerusalem tomb bearing the inscription "Jehohanan." That victim's heel bone was still attached to a piece of wood by a nail driven through the side of the heel (see my book *Inquest on the Shroud of Turin* [62, v65]). (In neither instance was there clear evidence of the wrists being nailed, and it is assumed they were tied.)

The discovery is quite revealing because it is consistent with the only other apparent crucifixion wound known to archaeology.

While the nailed heels of the 1968 and 2007 discoveries are mutually corroborative, they do not support either of the foot placements depicted for Jesus in Christian art. The earliest representations showed the feet nailed separately, side by side; much later depictions had one foot crossed over the other and both secured by a single nail. The Shroud of Turin, which appeared in the middle of the fourteenth century, has the feet placed separately, although the left one points inward, indicating the artist probably intended to suggest a crossed-feet position, which by then was conventional.

Thus, admittedly very limited data suggests that the foot placement represented on the Shroud of Turin is incompatible with the two known burials of actual crucifixion victims. Instead, the Shroud placement matches the more recent of two styles imagined by artists as well as copious data (e.g., radiocarbon dating) that identifies the cloth as fourteenth century. That is consistent with a fourteenth-century bishop's report that a forger confessed to having "cunningly painted" the image.

Joe Nickell is CSI's senior research fellow and SI's Investigative Files columnist. He is author of, among many other books, *Inquest on the Shroud of Turin* (Prometheus Books, 1998).

Small Town Virgin Mary 'Miracle': Olive Oil

Benjamin Radford

On Sunday May 20, 2018, a statue of Mary allegedly began weeping at the Our Lady of Guadalupe Catholic Church in the small town of Hobbs, in southeastern New Mexico near the Texas border. The event made national news and drew the faithful from all across the Southwest including Denver, some 600 miles away.

It's not clear when the "tears" first appeared; it could have been moments, hours, or even days before they were noticed, since the statue is not cleaned or closely examined daily. As with Lilian Bernas, an alleged Canadian stigmatic who Joe Nickell and I investigated in 2002, the miracle was not witnessed spontaneously appearing but instead had already begun by the time attention was drawn to it. This of course does not preclude the possibility of a miracle, but it does allow for either fraud or some natural explanation. There had been an earlier Mass that day at 8:30 AM, though no one noticed it at the time. Father Jose "Pepe" Segura, the pastor of the church, hadn't noticed it because his back was facing the statue during Mass. It was only later as he was outside greeting people that someone called his attention to it and he went back inside to look.

The smell of roses is a common theme in Catholic miracles, being mentioned for example in association with stigmatic Padre Pio and many Marian apparitions.

The Diocese of Las Cruces sent an investigation team to the church soon afterward. But there were already some clues about what might have happened. The tears, for instance, were described as "an oily residue." Judy Ronquillo, who works at the parish, told the *Carlsbad Current Argus* newspaper that "It's not a water-like substance. It's more oily and it smells like roses." The smell of roses is a common theme in Catholic miracles, being mentioned, for example, in association with stigmatic Padre Pio and many Marian apparitions. As Joe Nickell notes in his book *Looking for a Miracle*, fraudulent statues often "weep" a non-drying oil such as olive oil, which can retain a fresh appearance for long periods.

One need not postulate any elaborate hoaxing scheme involving secret tubes, hidden pumps, or the like. The simplest explanation—aside from a miracle—is that someone discreetly applied a bit of oil on the face of the statue when no one was looking.

Spokesman Deacon Jim Winder said that the investigation would involve interviewing witnesses, testing the substance for DNA, and determining the origin of the statue. Though he noted that it could take years to reach a conclusion, the statue's provenance has been fairly well established. Ricardo Flores-Kaspanis is one of the artists who made the statue. According to Flores-Kaspanis the hollow bronze statue was made at the Campanas Sonoras foundry in Mexico City in 2013. The piece, one of about seventy-five similar statues made from the same mold, is not painted; the color is the patina of the metal. A May 30 online article from KOB television by Casey Torres noted:

> Flores-Kaspanis said the statue was shipped out to a small parish in Maryland in 2014, but got a small crack after two or three years. Because most workers couldn't travel to Maryland to fix the crack, the statue was to be taken back to Mexico City for repairs. According to Flores-Kaspanis, the statue was taken to the Our Lady of Guadalupe Church in Hobbs on Aug. 8, 2017, before continuing its journey, but the church admired the statue so much that they asked if they could buy it.

Flores-Kaspanis was quoted in news media as at a loss to explain the apparent miracle, noting that bronze does not exude an oily substance and that there's no chemical reaction inside the statue that could create the "tears."

In July, about two months after the miracle appeared, the Catholic Diocese of Las Cruces announced that tests on the tears had been completed and that the substance was in fact a scented olive oil. Cantú dismissed suggestions that the olive oil indicated a mundane explanation: "Even if it were (a hoax), we are not sure how it would be done, physically. Because it is hardened bronze. We've examined the interior, and there's nothing on the interior," he told the *Las Cruces Sun News* on July 15.

One need not postulate any elaborate Rube Goldberg–type hoaxing scheme involving secret tubes, hidden pumps, or the like. The simplest explanation—aside from a miracle—is that someone discreetly applied a bit of oil on the face of the statue when no one was looking. Close up photographs of the statue's face reveal the oil seems to come from mainly from the statue's left eye and top of the cheekbone (not from the inside of the eye where the tear duct is located). Unless the church has surveillance cameras monitoring the area and recorded someone near the statue's face prior to the discovery, it's unlikely that anything definitive will be determined about how the "tears" came to be on the statue.

However, further DNA analysis could potentially yield some information as to its nature. A 2002 article in the journal *European Food Research and Technology* titled "Recovery and Characterization of DNA from Virgin Olive Oil" concluded that under some circumstances a genetic history could be determined from processed olive oil. Of course even if Mary's tears were traced to a particular olive grove owned by a specific produce company, for some true believers that would just make it all the more mysterious.

Adding to the mystery, Father Segura claimed that tears "reappeared" after people wiped the statue's face, though the act of daubing the tears by the faithful would have the effect on the smooth bronze surface of spreading the oil and giving the appearance of additional tears. It's also possible that the oily tears dripped there accidentally somehow, though the placement on the statue's eyes would be a remarkable coincidence.

It's also possible that the oily tears dripped there accidentally somehow, though the placement on the statue's eyes would be a remarkable coincidence.

Bishop Oscar Cantú has said he remains open to the possibility that the event is a miracle, though "As the bishop, I have to kind of have a distance and a kind of a healthy dose of skepticism as well." Some churchgoers expressed their belief that Mary is crying because of recent violence in society—perhaps referring to school shootings and the like—though that argument could apply to nearly any given time; no matter when the statue wept, the faithful could point to some recent social malice that prompted the miraculous message. ■

Benjamin Radford is the deputy editor of the Skeptical Inquirer.

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On the Set of *Cosmos*'s Season Two

Atop a small hill south of Santa Fe, New Mexico, just far enough east of Interstate 25 not to be obvious from the highway, rises a large multistory structure. Its adobe-like earth tones and setback style remind you of the great Southwest pueblos. But something far more modern is going on there. This is Santa Fe Studios, built in 2011 and home to a variety of movie and television productions, all part of New Mexico's burgeoning filmmaking industry.

We visited there one day recently to see Ann Druyan, Neil deGrasse Tyson, and colleagues filming the second season of their television science series *Cosmos*. The first Druyan-Tyson *Cosmos* (*Cosmos: A Spacetime Odyssey*) aired in 2014 to much acclaim. (In addition to its other honors, our Committee for Skeptical Inquiry gave it CSI's Robert P. Balles Prize in Critical Thinking.) That series was of course a fresh incarnation of Carl Sagan's original blockbuster *Cosmos* series and book of 1980. Sagan and Druyan were husband and wife, and they worked together on that original series. So in a way, the new thirteen-episode *Cosmos: Possible Worlds*, to premier on multiple Fox and National Geographic Channels in the United States and at least 171 other countries in Spring 2019, is the third incarnation of the *Cosmos* brand, all with Sagan-esque origins and style.

Photo by Kendrick Frazier

Santa Fe Studios.

With all this luminous history in mind, we somewhat nervously step inside the vast studio building. Vanessa Goodwin, Druyan's assistant, shows us around. First stop is the Art Department. There in a large open room artists work at desks and computers surrounded by walls filled top to bottom with photoboards of what is to be filmed. Hundreds of oversize images of everything from ancient Mesopotamian cities to today's Amsterdam to future interstellar spacecraft adorn the walls. Tyson appears in the middle of some of them, but he's CGI'd in. The filming hasn't been done yet. The sites in Europe and elsewhere haven't been visited. Virtually every scene of all thirteen episodes is pictured, or at least plausibly envisioned, on these walls. This is essential in planning something so complex, Goodwin points out.

Down one hall is a long, well-lit costume room, where we see ready-made

costumes for all manner of characters to appear in the series. I see outfits for Neanderthals, for historical figures such as Galileo, Darwin, and Christopher Huygens … and some more modern characters that they hope may surprise you.

In a ground-floor warehouse-size room we visit sets for the series already built or being constructed, Paleolithic caves and ancient buildings of Persia and Egypt among them. They offer a sense of impending importance.

Then comes time to enter the soundstage area. I'm not quite prepared. All we can see at first, right in the middle, is a huge green curtain, three stories high, arranged in a circle. Just outside it, sitting in a director's chair in front of dual video monitors is—well, it turns out to be Ann Druyan. She smiles, rises, and greets my wife, Ruth, and me with big hugs, warmly and generously. She's smaller and slighter than I remember, but that may be only because today she has some laryngitis. Her voice is small, but her energy level seems high. We all first met in 1994 at a little gathering in Seattle that CSICOP founder Paul Kurtz arranged for Sagan and members of the CSICOP Executive Council to meet and talk over lunch. That was during CSICOP's Seattle conference, at which Sagan gave the keynote address. It was his second and last for our organization.

Ann Druyan takes us over to greet Neil deGrasse. He is the vintage Tyson, nattily dressed in dark suit and dark shirt (no vest or science tie like he often wears on TV).

In the years since Sagan's untimely death in 1996, Druyan has written several times for the Skeptical Inquirer, including her wonderful personal cover article "Ann Druyan Talks About Science, Religion, Wonder, Awe … and Carl Sagan" (November/December 2003) and her passionate, moving epilogue ("The Great Turning Away") to a July/August 2005 cover article printing the rediscovered transcript of Sagan's answers to questions at that 1994 Seattle conference. In 2014 she answered our questions about the new *Cosmos* and appeared on our cover with Tyson ("Ann Druyan on the Wonder of *Cosmos*," September/October 2014).

She is a longtime fellow of the Committee for Skeptical Inquiry (formerly CSICOP), as was, of course, Sagan—as also is Neil deGrasse Tyson, *Cosmos*'s on-camera host. Speaking of whom, to my surprise (I didn't expect he'd be there), Druyan points out he is talking to some people just a few feet away from us. He's between stints filming on the soundstage. She takes us over to greet him. He is the vintage Tyson, nattily dressed in dark suit and dark shirt (no vest or science tie like he often wears on TV). He comes over and gives us a friendly greeting and asks about SI. It turns out we have arrived at a short break in the filming of his on-camera narrations for episode 11.

Little of the filming is done in sequence. Portions of episode 11 may be filmed today, episode 9 the next, episode 3 the next. There is a detailed master plan for all this. There has to be, with a crew of two hundred busily working and a twelve-hour-day shooting schedule. "There are a lot of moving parts," Druyan notes.

She has us sit in two vacant director chairs behind her and next to *Cosmos* science advisor Andre Bormanis, a congenial companion during our several hours there. We also meet the show's director, Brannon Braga. He moves about

a lot but sometimes sits in front of the second monitor next to Druyan.

Druyan turns back to us and expresses great worry about the state of science today in our current social and political milieu. With all the antiscience rhetoric and actions from political figures and other leaders, "It's as bad as I've seen in my lifetime," she says.

She hopes *Cosmos* can help correct that. She says her cocreators and crew relish taking part in something they find so crucially important. "I think they find it rewarding to be working on something meaningful in this desperate moment in our lives." She emphasizes one of the series' key points: "That truth matters."

I ask if the script is completed. I'd heard that the 2014 season was being filmed while some of the script was still being written. "It's all complete," she says, with an air of pride and relief. "I learned my lesson."

How might the 2019 *Cosmos* differ from the 2014 series? "It's much more ambitious," she says. "It is a much bigger production." She adds, "I think it will be way more inspiring. I hope so." She says she expects it to be "more emotional"—not the science, she quickly reassures us, but the human stories will be "more heart-based" with a strong emphasis on "a hopeful future." She worries, as do I, that young people today lack inspiration and hope about the future, and she wants to restore those things.

Over the previous two years back home in Ithaca, New York, she wrote the script and with Braga hammered out the detailed plans for filming. Having devoted that much time to the process, the production is now expected to proceed without serious setbacks.

This time, I was excited to learn, there will also be a companion book, and she is its author. It is very much in progress. "I am getting up in the mornings at 4 AM to write the book for three hours. Then I come here." The book, she points out, has to stand on its own as a book with a cohesive voice: hers. It all sounds exhausting. It probably is but is probably exhilarating too.

Tyson gets the call, and up he goes onto the circular stage behind the green curtains. I take a quick peek in. The floor is divided into concentric rings that can be elevated to different levels. For these next shots, the center core has descended so that the camera can peer up at him from well below. Later I find it way up in the air.

This stage, with its vast green-screen curtains and later-applied CGI magic—which a video editor off to the side kindly demonstrated to me using the video-editing software on his computer—will be transformed into *Cosmos*'s "ship of the imagination" scenes.

Then come the commands "Quiet!" and "Action," and Tyson begins delivering some of Druyan's poetic passages in his own inimitable style and with that rich voice that we've come to know from his television and radio appearances, including the 2014 *Cosmos*. This passage seems to be about living some time in the future on Neptune's moon Triton. He finishes. Then does a second take, then a third. Druyan is directing him, approving or sometimes asking for just a little different emphasis here or there. Then that part is done, and he returns to a chair off to our right.

Over the next few hours the whole process gets repeated multiple times, using different parts of the script.

From time to time he comes over to talk with us. This filming at Santa Fe Studios began two weeks earlier and will continue for five more weeks, he tells us. There'll also be some on-location shoots in scenic parts of New Mexico, including on tribal lands. Before coming to New Mexico, they filmed at JPL, control center for so many epic spacecraft planetary explorations. After they're done here, they'll return to California briefly, then go to the Pacific Northwest, and then are off to Europe and Asia for an extended series of on-location visits. Then back to California for three months of post-production.

As we head to the exit, Druyan walks with us. In addition to her creative production people, she extolls another key person crucial to bringing the new *Cosmos* to fruition: the multitalented actor/entertainer/creator Seth MacFarlane (executive producer), who had the contacts at Fox and even helped with funding.

Cosmos: Possible Worlds will debut in the spring of 2019.

What's it going to be like? I can't say for sure. We saw only brief disconnected glimpses. But I trust the vision of Ann Druyan and all the other creative people she has surrounded herself with. More than likely I think you can expect that next year millions of us worldwide will be watching evocative stories of human discovery, past and present, some much-needed celebrations of science and reason, and an altogether new and inspiring glimpse of our cosmos. ■

Kendrick Frazier is editor of the SKEPTICAL INQUIRER.

Druyan turns back to us and expresses great worry about the state of science today in our current social and political milieu. With all the antiscience rhetoric and actions from political figures and other leaders, "It's as bad as I've seen in my lifetime," she says.

Ghostly 'Black Monk' or Random Tourist?

KENNY BIDDLE

Several British tabloids and paranormal-themed websites reported that a ghostly black monk appeared in a photograph taken by Jon Wickes during a visit to Eynsford Castle in Kent. Wickes had taken his twelve-year-old son to the castle because he was learning about medieval castles in school. The photo, taken from outside the ruined remains of the castle, shows a dark figure standing in the courtyard. The figure is positioned within an opening between a stone wall and the railing of a stairway leading up to the courtyard.

According to the *Daily Record*: "Upon returning from the castle, Wickes noticed an unexplained figure lurking in the background, shrouded in a black cloak." This statement tells us Wickes had apparently left the castle and was already back home before he looked at the photos and noticed the figure. He no longer had the opportunity to verify if the figure was someone else who wandered into the frame. The figure is also not "lurking" in the background; it's simply standing there with its back facing the camera.

Wickes is quoted in the article claiming "I was certain that figure hadn't been there when I took the picture." This is a common claim made after the discovery of a seeming anomaly well after the photo was taken. However, Wickes gives us no indication he was actually paying any attention to this detail; therefore, his claim that "no one was there" is not particularly convincing. He also states, "We only went to take a few pictures because [my son] wanted to know how a castle was built." The father and son pair did not go to the castle looking for ghosts or to investigate the location in a controlled environment. They went there as tourists, nothing more. I am curious as to the other photos he had taken, which may offer a look at any other tourists.

Photo taken by Jon Wickes allegedly showing a ghostly black monk at Eynsford Castle, Kent. Photo copyright Mercury Press & Media.

The figure was associated with a paranormal experience rather than just another tourist at the castle. That's a big assumption from a photo taken at a location freely open to visitors.

It's odd that when Wickes finally looked at the image, he reportedly went directly to a paranormal investigator for help (Rowney 2018). Another article states Wickes "looked on the web. That's when I read about a monk being seen in the area" (Joseph 2018) and then contacted the paranormal investigator. In both cases, the figure was associated with a paranormal experience—specifically the ghost of a monk—rather than just another tourist at the castle. That's a big assumption from a photo taken at a location freely open to visitors.

The paranormal investigator, Alan Tigwell, is quoted saying, "there is no explanation for the figure in the picture" after spending time in the castle's grounds. The article goes on to state that the investigator claims it is a "fan-

tastic" image. On the contrary, there is a perfectly reasonable explanation: it could be another tourist standing there and Wickes simply didn't notice them. The "ghost" is standing in the courtyard of the ruined castle, and from the distance at which Wickes took the photo, he could have easily missed the relatively small figure in the scene. He could have mistaken the person as being part of the structure or a discoloration of the wall, which is not uncommon when looking through a viewfinder or the small display of the camera. From the image we see that the weather was overcast, leaving the area shaded by clouds and therefore in darker lighting. These lighting conditions dull the details of smaller background objects. When looking at a close-up of the available image, we can see that the figure has a strap going from their left shoulder, down across their back, and ending at their right hip/thigh area. This is most likely a satchel or woman's purse slung over a black coat.

Close-up of figure. When enhanced (right image), what appears to be a shoulder strap and satchel/purse stands out. Photo copyright Mercury Press & Media.

Original close-up (left) and author's re-creation (right).

Comparison photograph by author.

When I did a search on Alan Tigwell, almost all of the returns pointed back to this story. I did find him mentioned on a website called Haunted Hostelries in the Authority of Dover, which listed him as the designated ghost specialist for Dover, Kent. I reached out to Tigwell for comment rather than relying solely on quotes in a tabloid. He explained that his use of the word *fantastic* was part of a conversation he had with Wickes as part of a longer email trail. By "fantastic image" he meant that the picture would capture the imagination as to what the cause of the figure was (Tigwell 2018).

Although we don't have the other images to look at, we do know that other people were present, and that makes a stray tourist a more plausible explanation than a ghostly monk.

At the end of the *Daily Record* article, Tigwell is quoted stating, "The difficulty with looking at things retrospec-

tively is that it's impossible to say exactly what something is." This is often true and also applies to Wickes's original claim that no one was in the scene when he took the photo. Wickes looked at the photo after he had already left and only then decided, retroactively, that no one was there.

In my conversation with Tigwell, I asked about the other photos. He replied, "I haven't been given any other pictures from Wickes. When I've been involved in cases in the past, I find there does need to be a certain degree of faith in what I'm being told, i.e., taking the person at their word. Wickes was adamant [that] although there were some other people at the castle, none were at this location when he was taking the picture." Although we don't have the other images to look at, we do know that other people were present, and that makes a stray tourist a more plausible explanation than a ghostly monk. The grounds are not very large or extensive, as seen by aerial views from Google Earth. A handful of tourists could easily get into a photograph, especially when the photographer is outside the castle walls.

Tigwell did visit Eynsford Castle to look for possible causes. In an online paranormal group in which the photo was posted, there was much speculation that the ghost was actually an alcove or doorway. Tigwell freely shared his notes with me, and he did a pretty good job of figuring out where all the wall features lined up within the frame of the original photo. Even though he did not find a cause for the alleged ghost during his visit, he at least took the time to go on location and rule out the possibility of doors, alcoves, or any other features that may have caused the anomaly to show up.

I then asked him what his conclusion was, based on what he found. He stated:

> I wish there was a clear answer, but without being there at the time and observing the pictures being taken, it's impossible to say when you retrospectively review a picture such as this. You and I both know there are a number of potential explanations, hence the reason I only confirmed whether anything in the castle itself could cause the figure/shape.

This is a fair answer. There are a few important details missing; therefore, we can't conclude what the figure is with 100 percent accuracy.

The conclusion Tigwell gave me presents a different impression than what many of the tabloid articles gave us, such as "Jon Wickes said a paranormal investigator couldn't explain the spooky figure" from News.com.au (Schneider 2018). This gives the impression that the spooky figure is probably a ghost, since a paranormal investigator failed to explain it. Tigwell ruled out what he could and didn't speculate on what he could not.

Our re-creation is a good match for the ghostly black monk and shows that the tourist idea is plausible.

After a few discussions with colleagues, the question was brought up whether tourists actually dress in a similar way the figure in the "ghost" picture does; i.e., a long black or dark colored coat and a satchel or purse. Since it was taken in January 2018, it was most likely during cooler weather. In fact, according to TimeAndDate.com, average temperatures in the London area the weekend prior to the story coming out were in the thirties Fahrenheit, and it happened to be overcast like we see in the photo. There were also scattered showers, which may also be a factor, determining whether a tourist had the hood of their coat up or not. A long coat would not be out of place. In addition, my wife graciously volunteered to put on her long, black coat and assist me in trying to recreate the figure. We drove over to Bryn Athyn cathedral where she stood near a stone wall, facing it with her back toward me. She held her forearms up in front of her, as a tourist would be holding a camera. She also had the hood up over her head, which simulates a tourist wearing a hood or the long dark hair of a woman. I set up about a hundred feet away and snapped a few photos. Our re-creation is a good match for the ghostly black monk and shows that the tourist idea is plausible.

In the end, Occam's Razor suggests this alleged ghost is most likely a tourist wearing a satchel and admiring the large stone wall in front of them. From the close-up image, it appears they are facing the large wall and their back is to the camera. Their arms are bent at the elbows, as when someone is holding a camera in front of them. This is the simplest explanation and makes the fewest assumptions without invoking any supernatural entities. ■

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Kenny Biddle is a science enthusiast who investigates claims of paranormal experiences, equipment, photos, and video. He promotes science, critical thinking, and skepticism through his blog, *I Am Kenny Biddle*.

We Need a Paradigm Shift in Science Advocacy

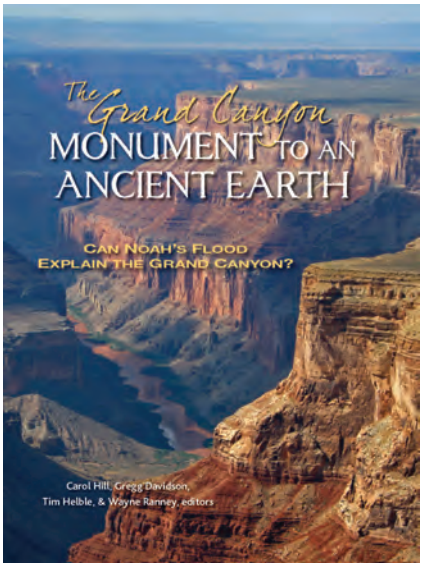
Considering the Human Concerns of Trust and Tribe

GREGG DAVIDSON, CAROL HILL, AND KEN WOLGEMUTH

Readers of the Skeptical Inquirer probably do not need documentation or reminders of the problem of deeply entrenched antiscience sentiments among the citizenry of the United States. For those not keeping up with the studies, recent polls suggest the societal needle has not substantially moved in the past thirty years regarding public acceptance on a range of scientific subjects.

As an illustrative example, a 1982 Gallup poll asked a question regarding opinions on human evolution. At the time, 44 percent said they believed God made man supernaturally in our current form. In a 2014 poll, 42 percent still answered the same (Gallup 2015). The future does not hold promise of rapid improvement. Michael B. Berkman and Eric Plutzer (2011) reported that among high school science teachers, nearly three quarters are reluctant to teach on subjects such as evolution, either because they personally reject it or they feel it isn't worth the controversy it may create. This is despite a quarter century of improved educational materials, upgraded K–12 science standards, and several successful court battles.

It should be clear by now that the strategies employed to improve science literacy have fallen short of expectations. Moving forward, we could continue to repeat the same approaches, expecting a different result (an often stated definition of insanity), or we could recognize the need for a genuinely different approach—a *paradigm shift*. The shift that we will advocate, based on our own experiences and successes on this front, comes in two parts. The first is to develop a more accurate understanding of



the opposition. Science deniers are often characterized as backward, uneducated religious and political conservatives who are blindly adhering to outdated beliefs and simply need to be educated or outvoted. In reality, the ranks of those opposed to subjects such as deep time and evolution include successful doctors, engineers, lawyers, business leaders, and politicians. Young-Earth creationist leaders include individuals such as Kurt Wise, a vertebrate paleontologist who earned his PhD from Harvard under the late champion of evolution, Stephen Jay Gould. Mental deficiency and poor education are not adequate explanations for belief in creationism. Denigrating the intelligence of such people serves no useful purpose beyond fanning the flames of polarization.

The one stereotype that is justified is religious affiliation. In the United States, the affiliation is predominantly Christian. While all religions disavow a purely mechanistic origin to the universe, views vary within the Christian faith regarding the proper understanding of the creation story, whether it must be understood as a literal six days or as a more poetic/allegorical rendering of God's creative authorship. For the subset who believe the foundation of their religion rests on a literal understanding of the creation story, improved educational materials serve no purpose because they go unread. Contrary to popular opinion, this is not just willful blindness. The body of scientific information available is far greater than any one person can digest, and most people do not have the technical skills to evaluate the raw data. As a result, people naturally turn to experts they feel they can trust to provide a synopsis of the data and its meaning. This brings us to the second part of the paradigm change: recognition of the importance of trust when challenging entrenched beliefs.

According to a study by Dan M. Kahan et al. (2011) on why scientific consensus fails to persuade, the degree to which "experts" are trusted depends on how well they align with the cultural values of the audience—whether they are inside or outside the "tribe." This is not a one-sided affair. It is human na-

ture to give greater weight to the views of those who are within the clan. (Consider the likelihood of an atheist paying attention to the evidence for God given by a respected scientist versus from a preacher with no formal education.) In the present context, if the scientists arguing a case to a religious audience are avowed atheists or promote views openly antagonistic to all forms of religious belief, the message is effectively dead on arrival. The ability of the messenger to interpret the data in an unbiased manner is not trusted and thus deemed unworthy of attention. Ironically, books and speaking tours of touted atheists striving to advance science education can actually make the situation worse. The science-*against*-religion message effectively vaccinates the science-dubious public against ever considering the evidence, and it deepens the divide.

The solution is simple, though perhaps difficult to swallow for the committed materialist. The voices that people listen to are the ones that share their fundamental worldview—those that are inside the *tribe*; those that have earned *trust*. This means the greatest hope for moving the cultural needle will be through the efforts of scientists of faith, speaking to their own faith-based communities to reconcile perceived conflicts. We have been encouraged by our own experiences visiting Christian seminaries, colleges, and churches. Once the requisite trust is established, minds become much more open to considering the veracity of natural evidence. We have seen former science deniers become excited even on subjects such as evolution when presented by someone who affirms their own faith, who can explain how they themselves wrestled through apparent conflicts that, in hindsight, were not what they seemed.

So what does this mean in terms of practical science advocacy? This could be as simple as keeping a short list of sources (websites, blogs, or books) that promote good science from a Christian (or other religious) perspective that can be recommended to someone struggling between religious belief and science. There is no shortage of resources that may be tapped for recommendations. We have listed a few organizations with easily found websites at the end of this article, each containing additional resources within.

For our part, we are excited about the recent release of a multiauthor, full-color book, *The Grand Canyon, Monument to an Ancient Earth* (Hill et al. 2016), that we helped write that elucidates the expectations of conventional (scientific) and flood (young-Earth creationist) geology, and compares these competing models with what we actually find in the canyon. [A summary lauding the book appears in the July/August 2018 Skeptical Inquirer New & Notable column, page 60. —Editor.] We and the other authors wrote it primarily with a Christian audience in mind. Eight of the authors are Christians; three are not. All are committed to the advancement of good science. We gently demonstrate the scientific and biblical vacuity of claims that Noah's Flood can explain the canyon and its layers.

The degree to which "experts" are trusted depends on how well they align with the cultural values of the audience—whether they are inside or outside the "tribe."

The book represents the type of material that we hope will begin to appear on shelves across the nation as a ready resource that can be pulled off and loaned or recommended to religious-minded people harboring suspicion of particular categories of science. Recognizing the importance of trust and tribe, such works can be presented openly as including authors who share the religious worldview of those wrestling with the scientific issues. As trust is earned and real science is engaged, often for the first time, we look forward to seeing the cultural needle move toward a greater appreciation and acceptance of good science. ■

Note

A slightly different version of this commentary appeared originally in *GSA Today* (July 2017), a professional journal of the Geological Society of America.

Example Organizations/Blogs That Promote Good Science from a Religious Perspective

- BioLogos
- Natural Historian *(Naturalis Historia)*
- AAAS Dialog on Religion and Ethics
- Solid Rock Lectures
- Old Earth Ministries

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Outside the Box: Solving Diverse Mysteries

In contrast to mystery mongers, I insist that mysteries should not be fostered but investigated with the intent of solving them. I like them so much I have never really cared whether some case could be pigeonholed into a specific category, let alone what that category might be. "Probing Paranormal, Historical, and Forensic Enigmas," I offered in the subtitle to one book; in fact one chapter—"The Crashed-Saucer Documents" (relating to the 1947 "Roswell Incident")—could be labeled all three.

I find that good mysteries of whatever category require much the same set of tools—a magnifying glass perhaps but also the ability to observe carefully and think critically, as well as to prioritize hypotheses and discover corroborative evidence—that is, to go well beyond rounding up the usual suspects and to think outside the proverbial box.

See what you make of these, some of my diverse and puzzling mysteries, all of them having gone unsolved for varying times—from as little as a four-year span to as much as some two and a half centuries. (Thanks to Eugenie Scott for encouraging me to write this article.)

Unsolved Homicide: Case of the Shrinking Bullet

One of the most challenging cases I have faced began on the afternoon of December 13, 1982, when a BMW was found ablaze beside a pasture in rural central Kentucky. Firemen called to the scene discovered a body, partially inside, and a .38 revolver lying on the ground near the victim's feet.

Lexington-Fayette County police secured the scene and began to uncover a mystery that would prove almost unsolvable. Although the victim was soon identified by dental records as a local horseman and the *cause* of his death as a bullet through the head, the *mode* of death became highly controversial: Was it suicide or homicide? The basic facts are these.

The case for murder began when the state's forensic anthropologist was able to partially reconstruct the skull. This showed that a bullet had entered the right eye socket to produce a hole just a quarter inch in diameter—too small for the .38 caliber pistol at the crime scene. The victim had also told numerous people that he was being followed that day by a dark car. A coroner's inquest returned a finding of homicide.

The police came to a different view, observing that the pistol at the scene, with one shot fired, was the victim's; that he was deeply in debt and depressed, even talking of suicide; that he had secretly taken out insurance that would pay double indemnity—except for suicide; and that his claims of being followed were suspect. He had apparently bought the kerosene can found at the scene, and its cap was revealingly located *under* his dead body. Detectives suspected he had staged the "homicide" for his family's benefit, leaning with one arm braced on the open car door and shooting himself so his body would fall forward into the burning interior.

I followed news of the case with interest and discussed it with forensic analyst John Fischer, who had assisted me in several cases. At a forensic conference at which we were both presenters, we talked with a crime-scene technician from the Lexington police who encouraged our involvement. Subsequently, our efforts were welcomed by homicide commander Drexel T. Neal, who gave us full access to the case file and evidence.

In our investigation, we had a "psychological autopsy" performed on the victim, which demonstrated he was definitely suicidal. Although the crime lab's tests on the gun for "blowback" (blood, vitreous fluid, etc.) were "negative," we suspected the tests had involved only a routine swabbing and testing with a reagent. Examining the revolver, I noticed spatter droplets on the barrel and cylinder. Later, extensive laboratory examination showed the degraded substance was consistent with an organic substance such as blood, and a noted blood-pattern analyst concluded that the location, size, and shape of the markings were "compatible with spatter produced by a gunshot wound."

What remained was the crux issue of the caliber of the fatal bullet. In the forensic literature, we discovered an earlier case in which an entrance hole in thin bone *was smaller than the diameter of the bullet that caused it*! Like the one in our case, it had an unusual "keyhole" shape. After much thought, we theorized that, as the bullet's nose struck tangentially, it made the initial small hole, while radiating stress fractures produced the wedge-shaped portion; as the larger part of the bullet continued on through, the "jaws" of the semicircular portion opened slightly and then sprang back after the bullet passed.

Finally, we replicated the keyhole defect in our case using a similar Smith and Wesson .38-caliber revolver and the eye socket of a deer skull. The resulting defect measured only about 0.287 inches across—seemingly im-

possible for such a large bullet. Our work resulted in a forensic article and the final closing of a most difficult case. (For more, see Joe Nickell with John F. Fischer, *Mysterious Realms*, Prometheus Books, 1992, 107–129.)

Bibliographic Enigma: An Entire Lost Edition

According to scholar Edward H. Cohen (in *Ebenezer Cooke*, Athens: University of Georgia Press, 1975, 46), "In all of colonial American literature there is no problem so perplexing as that of the textual history of the *Sot-Weed Factor*." This problem concerns a completely missing second edition of Ebenezer Cooke's satirical work whose title translates as "tobacco merchant." Written after Cooke, an Englishman, had visited America, it presents a contemptuous view of American planters and life in the tobacco-producing colonies.

Later, after Cooke (ca. 1665–ca. 1732) and his sister Anna inherited land in Maryland, he took up residence there (by 1717). Not surprisingly, he would soon change his tune about deriding his fellow immigrants and pen a sequel to the satire, a less caustic work more sympathetic to the colonists. The sequel aside, he did go on to publish a second and third edition of what was becoming an important literary work. The last embodiment was in Cooke's *The Maryland Muse* (1731), which included "The Sotweed Factor" as "The Third Edition, Corrected and Amended." Today the British Library has the only known copy of this book.

The *second* edition is even rarer—that is to say, not a single copy has been found, either in England or America. Its former existence, however, is indicated by the presence of the *third*, as we have seen. However, Cohen observes that a sole reference to some drafts of a text "design'd for a preface" to "this Second edition" of *The Sot-Weed Factor* does not constitute proof that the intended edition was ever actually published. Yet if it were not, why would Cooke have himself subsequently denoted a third?

Such was the case when, as a graduate student in English at the University of Kentucky in the mid-1980s, I took a course in Colonial American Literature. It was taught by the distinguished scholar John T. Shawcross. Whereas some of my professors would allow only *critical* papers, he was aware of my background (including my having been a Pinkerton detective) and he allowed—even encouraged—my writing investigative ones.

One day after class, I brought up the enigma of the lost Cooke edition. "Yes?" he responded, showing real interest. "I think I've found it," I said, and his eyes danced. When I explained my preliminary findings, he nodded enthusiastically and promised to help me in any way.

I had begun by realizing that the word *edition* had a looser meaning in Cooke's time than ours. I suspected that the "sequel," called *Sotweed Redivivus*, actually *was* our missing second edition. After all, it was Cooke's second *Sotweed* book, and the adjective *redivivus* (meaning "revived" or "reappearing") could be interpreted as "reissued."

I find that good mysteries of whatever category require much the same set of tools—a magnifying glass perhaps but also the ability to observe carefully and think critically.

But I had more than just a good hypothesis. In content, *Sotweed Redivivus*—while having significant differences from the original *Sot-weed Factor*—has analogous passages that are so similar to it in form and phrasing as to seemingly belie the idea of its being a sequel. It is instead much more like a revised work. Cooke, I think, intended to transform his "sotweed poem" into a new, distinctly American edition—a *Sotweed Redivivus*.

That the *redivivus* version is indeed the long sought second edition is made quite clear by comparing words and phrases in the drafts of the preface for a second edition with those used in the actual preface of *Sotweed Redivivus*. They are too similar to be coincidence and constitute proof that the famously "lost" second edition was no such thing—having been in plain view for some two and a half centuries! (See my *Unsolved History*, University Press of Kentucky, 2005, 106–117.)

Literary Mystery: Hawthorne's 'Veiled Lady'

In his novel *The Blithedale Romance* (1852), Nathaniel Hawthorne penned a study of a utopian community that grew out of his own residency at Brook Farm (the famous 1840s experiment in communal living in Massachusetts) during 1841. He kept notebooks whose entries reflected on that idealistic population of writers and reformers, and a year later he mined those source-books, along with his own memory, for his novel's characters and incidents.

So extensively in fact did the novelist use real-life models for the people and events in *Blithedale* that we must wonder whether yet another character therein—the "Veiled Lady" of the romance, a fake trance medium who was exploited by a charlatan—might have likewise been based on a real person. Might she not, indeed, have been based on an actual stage performer who toured New England in Hawthorne's time? Hawthorne had styled his Veiled Lady as a "hitherto inexplicable phenomenon" in a "hall of exhibition" by a "magician." Even from a great distance she can hear "the lowest whispered breath" through her "gift of second sight and prophecy," which in fact results from nothing more than "juggling tricks"—the whole interest of spectators being "further wrought up by the enigma of her identity."

Hawthorne's Veiled Lady represents what is known in stage-magic parlance as a "second-sight routine"—a very old trick in which a magician, working with a psychic medium, secretly conveys to her by clever means the information on chosen objects and whispered utterances. So accurate is Hawthorne's portrayal of such a psychic act that I believed there was likely a real-life model behind the fiction. Therefore, I looked and soon found her!

Performing throughout New England at the time in question, the 1840s, she was advertised in playbills and identified only as "The Mysterious Lady," an "extraordinary individual." An advertisement promised:

> By the exertion of a faculty hitherto unknown, this lady is enabled to perform apparent impossibilities. She will describe minutely objects which are placed in such a situation as to render it wholly out of her power to see any portion of them. Repeat sentences which have been uttered in her absence and perform many other paradoxical feats of the mind … , the first exhibition of its kind ever seen in America … .

In addition to the similar names—Hawthorne's Veiled Lady for the real Mysterious Lady—both concealed their identities. Both performed similar magic acts in exhibition halls, and so on and on. Such parallels gain added weight when taken together.

While the Mysterious Lady made no appearance in Hawthorne's journals, a letter to his wife on October 18, 1841, showed that the couple was interested in such phenomena at the time. Hawthorne said to her, "I think that they are accounted for as the result of a physical and material, not of a spiritual, influence." (Note that Hawthorne was a fellow skeptic!) His interest in such magical performances and a willingness to portray them with fidelity to detail, including his recognition of hokum, led him once again to draw a fictional character, the Veiled Lady, from her real-life model the Mysterious Lady—as I believe the evidence clearly indicates. (Again, see my *Unsolved History*, 2005, 118–131.)

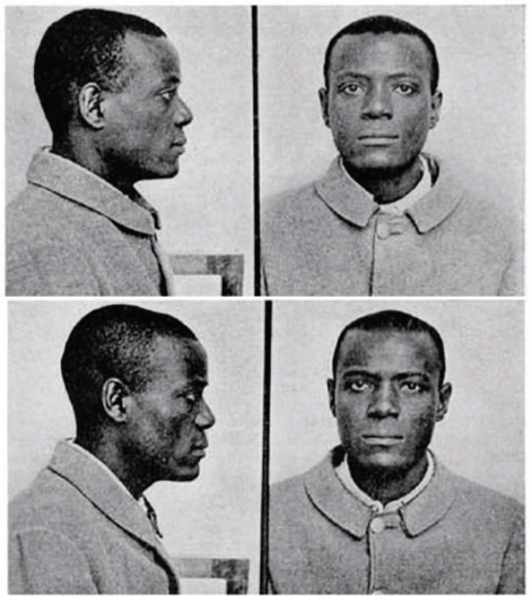

Figure 1. The case of "the two Will Wests," the remarkable look-alikes, caused fingerprinting to replace physical measurements for criminal identification in American law enforcement.

Questioned Identity: Riddle of the Two Will Wests

On May 1, 1903, a young African American named Will West was admitted to Leavenworth Penitentiary in Kansas. At that time, before fingerprinting, the Bertillon system was used and depended on a series of body measurements (length and breadth of skull, length of outstretched arms, and nine other measurements). West's data turned up a prior file for "William West." Although photos in that file were remarkably similar, the new prisoner insisted they were not of him. Indeed, the two were different individuals, and their case has been considered the most remarkable resemblance of two unrelated persons in history.

Nevertheless, the two men's fingerprints proved completely different, presenting not the slightest problem in distinguishing one person from the other. In fact, identification experts had been waiting for just such an opportunity to prove the superiority of fingerprints over physical measurements. Before long, fingerprinting became the mainstay among identification experts throughout law enforcement.

That is the famous case as it was usually presented, and I had grown up on it, knowing I was a detective at the age of eight. But by the time I became a real detective, and again encountered the story, I had become a professional skeptic as well. The "coincidence" of the similar names grated on me, and I hypothesized that they were identical twins, possibly separated at birth.

Today, the matter would be settled by DNA tests, but those were not available in 1903. In 1979, when I began my investigation, DNA testing was still some five years in the future and, anyway, there was no available genetic material of the Wests. So I had to be creative to test my hypothesis. I was encouraged by distinguished criminologist Andre A. Moenssens, and the FBI provided copies of the Wests' fingerprints and other materials.

Soon, two experts in twins' fingerprints at the University of Toronto determined, separately, that while the men's fingerprints were completely different as to individual characteristics, they had such similar pattern types, finger for finger, as to put the probability of their being *monozygotic* (one-egg or "identical") twins at an astronomical level. So did their similar ear configurations, plus the closely matching facial features and Bertillon measurements, confirmed by experts, in each of those additional fields.

Corroborative evidence came from their similar biographical details (both born in Texas, for example) and the surprising testimony of a fellow prisoner whose statement in the files revealed that he knew both Wests personally and knew them to be twin brothers—even though they would still only admit to being "distantly related." Finally, the Wests' correspondence logs demonstrated that while in Leavenworth they had written to the same brother, the same five sisters, and the same Uncle George!

Case closed, but while I published my report in a major police-science journal and presented my findings to appreciative experts at an international forensic identification conference, I could still not explain the Wests' concealment of their actual twinship, except for a suggestion: possibly one twin had provided, on occasion, an alibi for the other. Stranger things have happened. (See my *Secrets of the Supernatural*, Prometheus Books, 1988, 75–88.)

* * *

These four cases—representing very diverse genres and problems—nevertheless were similarly challenging, inviting "outside the box" thinking. For me, separately and together, they taught valuable detective lessons. ■

NOTES ON A STRANGE WORLD] MASSIMO POLIDORO
Massimo Polidoro is an investigator of the paranormal, lecturer, and cofounder and head of CICAP, the Italian skeptics group. His website is at www.massimopolidoro.com.

A Telepathy Investigation

A local Italian newspaper, *La Nuova Provincia di Biella*, published an article titled "Mother and Daughter of Zubiena Communicate Through the Power of Thought." It reported a telepathic link that seems to exist between Carmela Paola and her daughter Amalia Maruca, both of Zubiena, a small town in the province of Biella. It's a link that was allegedly proven through the use of Zener cards. According to the newspaper, the two women have an accuracy that varies between 90 percent and 100 percent. Each one almost always guesses the symbol (circle, cross, waves, square, or star) the other is thinking of—an experience that, if confirmed, would represent the first case in the world of documentable telepathy. It would be an exceptional discovery, as well as the opportunity to bring home numerous prizes offered around the world to those who could first demonstrate any skill of this kind.

According to the newspaper, each woman almost always guesses the symbol the other is thinking of—an experience that, if confirmed, would represent the first case in the world of documentable telepathy.

'This Case Has Really Struck Me'

The case, of course, attracted the attention of CICAP, the Italian skeptics committee. I got in touch with Alberto Serena of the Biella association NuovaMente (NewMind). It is he, in fact, who discovered the talent of the two women by subjecting them to tests with a deck of Zener cards (cards that appear to be those that were attached to one of my first books: *Are You Psychic?*, published in 1997!).

When he talks about Carmela and Amalia, Serena cannot hide his enthusiasm. "We have done all the necessary checks to avoid fraudulent tricks [*sic*] or similar things, also involving the experts of those associations born specifically to refute such facts," he says in the interview for the *La Nuova Provincia di Biella*. "And we could not find any anomaly: mother and daughter can communicate with the force of the mind with such extraordinary results. Personally I have been following these phenomena for about 30 years and I am not easily impressed but I have to say that this case has really struck me." Serena was happy to let us meet the two women and have them show us their skills.

Massimo Polidoro and Luigi Garlaschelli look over the mother and daughter during a preliminary test where they could see each other.

The "transmitter" takes note of the cards seen before transmitting them.

An Almost Perfect Success!

On September 22, 2016, my colleague Luigi Garlaschelli and I went to Biella, where we met the two women at NuovaMente. We were immediately struck by their desire not to seek publicity. They agreed to meet us because Serena had insisted, but after newspapers had talked about them they refused several invitations to appear on national television programs.

We asked the two women to give us a demonstration of what they can do and left them free to prepare and conduct the experiment themselves, as they usually do, without any interference from us. Carmela and Amalia took their seats on opposite sides of a table. One of them looked and tried to "transmit" the symbols of a previously mixed Zener deck one card at a time. On the other side sat the one who must try to receive the symbol thought by the other. A small screen about thirty inches high separated the two women, covering the cards from sight but allowing the two women to look at each other.

To eliminate the possibility of signals, even involuntary ones, we suggested the use of a higher screen, which prevents the two women from looking at each other.

During the procedure, the one who transmits the thought-of card marks on a sheet of paper the symbol transmitted; immediately afterward, the one who receives it marks the symbol received on a similar sheet. The first test under these conditions led to an almost perfect result: twenty-four cards (out of twenty-five) correctly guessed very quickly.

A Screen—and Disappearing Results

To eliminate the possibility of signals, even involuntary ones, we suggested the use of a higher screen, which prevents the two women from looking at each other. It is something that they had already done and that they agreed to repeat, while explaining that under these conditions their possibility of "coming into contact" diminishes, and, as a consequence, they warned us that their successes will probably also drop.

Indeed, this time only seven out of twenty-five cards were guessed right. It was a little above a chance result, but there are also those, such as magician Simone Ravenda, who have noticed in the past that under these conditions some sounds are frequently heard, such as the squeaking of the chair, movements, breaths, coughs, etc.

A pen writing on the surface of paper (when the transmitter writes down the symbol to be sent) produces different—and easily distinguishable—noises for each symbol drawn. The symbol of a circle produces a single sound, the cross two sounds, the wavy lines three, the square four, and the star five. It is clear that if you hear three or more sounds being drawn you will not draw a circle, even if it is the target that came to mind first.

"Sound reading," as this technique is called, is a classic trick of mentalists who wish to simulate telepathy phenomena. To eliminate this possibility, therefore, we gave the woman who transmits a tablet upon which with a finger she could silently draw the symbol. Under these conditions the result was five cards guessed out of twenty-five—exactly what one would expect by chance.

A series of images of both mother and daughter that show their constant, possibly involuntary, grimacing and signaling.

Non-Zener, Non-Transmission

The two women then explained that not being seen prevents them from communicating effectively. We agreed to again use the low screen, but this time we suggested the use of a different deck of cards, on which the five Zener symbols are no longer present; instead, some famous optical illusions are reproduced.

We chose twenty-five at random. After ten attempts, however, the women asked us to stop because they said they could not transmit anything. The drawings made by the receiver, in fact, did not resemble those transmitted, not even when they tried to find arbitrary correspondences in some details. So we tried with a normal deck of fifty-two playing cards, selecting twenty-five at random. This time the cards were correctly guessed twice, and there were also nine occasions in which the suit was guessed but not the number, and two in which the number was guessed correctly but not the suit.

At this point we stopped because, after more than two and a half hours of testing, Carmela and Amalia were understandably tired. However, there did not seem to be any possibility for future verification because the women told us, after our meeting, that they would no longer be interested in giving other demonstrations to anyone. A week later, however, they were again in public at the Università Popolare di Biella, where Serena introduced them before a new demonstration of their "telepathic" ability was given, also mentioning the presence of CICAP during the previous days.

The (Involuntary) Signals

One conclusion that we drew from these exploratory tests is that if telepathy is at play, then it must be very weak, since it only works with Zener cards, while it is absent when using other types of images or cards. Moreover, the real nature of this skill is strongly questioned by the fact that it disappears when the two women cannot look at each other. It is something that they themselves admit: "This kind of understanding is so natural to us," they said in an interview with *La Stampa* on August 10, "all this attention to us is also very surprising. There are no tricks, but surely we understand each other with looks. It always happens."

"Sound reading" is a classic trick of mentalists who wish to simulate telepathy phenomena. To eliminate this possibility, therefore, we gave the woman who transmits a tablet upon which with a finger she could silently draw the symbol.

During the tests in which mother and daughter could be observed, occasions were continuously noticed and photographed in which one or the other produced different types of body and facial movements, small or large; movements of the hands, of the shoulders, of the head, of the eyes, contracting the lips, serious expressions, smiles, movements of the nose, of the eyebrows, of the chin, and so on. They were not much different from what is usually done by those who play cards in pairs and try to silently signal to the partner the cards that one has in his hand. It is possible that these movements are involuntary, but the fact remains that when they are hidden from view (and other communication possibilities, such as sound, are prevented) the results drop to pure chance.

Agreement Yes, Telepathy No

Our conclusion is that Carmela and Amalia undoubtedly have a strong bond and—as they often say—manage to understand each other immediately with a glance, just as we have observed. However, it is possible that their close familiarity will, during the tests, lead them to make facial expressions that, in the past, they had seen work well during "transmission" of a very limited number of images.

Not surprisingly, when the experiment with a deck of cards that presented symbols different from those of the Zener cards was attempted, either no results of any kind were obtained (as with the cards of optical illusions that were unknown to the two women) or when using normal poker cards, occasional positive results were obtained using only the four suits of hearts, spades, clubs, and diamonds. If telepathy was really at play, it should be possible to transmit other information in addition to the five Zener symbols. In our opinion Carmela and Amalia certainly possess a talent for making the other person understand the figure each is thinking about, but that's not telepathy. ■

[BEHAVIOR & BELIEF

STUART VYSE

Stuart Vyse is a psychologist and author of *Believing in Magic: The Psychology of Superstition*, which won the William James Book Award of the American Psychological Association. He is a fellow of the Committee for Skeptical Inquiry.

Why Are Millennials Turning to Astrology?

Astrology, the oldest and most popular theory of human personality, doesn't work. I played a small role in proving astrology doesn't work when a student, an astrology enthusiast, came to me and said she wanted to conduct a test of astrology for her honors thesis research. To her credit, she was willing to let the chips fall where they may. With a little guidance, she designed a double-blind test in which college students were presented with their actual horoscope—based on a natal chart produced by a highly rated commercial astrology software program—and a bogus horoscope randomly selected from those produced for the other students in the study. Each participant had a 50/50 chance of picking their own horoscope, and that's about as well as they did. In fact, the students only scored a 46 percent accuracy rate, indicating that there was a slight—though not statistically significant—tendency for the students to pick the bogus astrology horoscope instead of their own.

To eliminate the possibility that the college students were just clueless about their personalities, my student also had each participant fill out a well-researched paper-and-pencil personality test. Presented with a similar choice—their own personality scale profile matched with some other random person's profile—the students did much better. This time, there was a 79 percent correct identification rate, which was far above what would be expected by chance. Thus, astrology didn't work, but a widely used personality test did. My student's honors thesis results were consistent with a long line of similar tests showing that astrology does not provide an accurate description of personality, and she went on to publish the study in the *Journal of General Psychology* (Wyman and Vyse 2008).

Although my student accepted the accuracy of her results, I am fairly certain she did not give up her belief in astrology, and she is not alone. Despite overwhelming evidence that astrology is based on a pseudoscientific theory and is not a reliable measure of personality—much less a crystal ball into the future—this ancient form of divination has not diminished in popularity. Indeed, Julie Beck (2018) writing in *The Atlantic* suggests that we are experiencing a boom in astrology among millennials driven by diminished stigma and marketing on the internet. Astrology is particularly popular in India where, according to one projection, the online industry will hit $3 billion (Magon 2017). But there may be other explanations for why astrology would be particularly popular at this moment.

The Basics

Astrology is a system of belief that implicates the location of the stars and planets at the time of a person's birth in the determination of their personality, and its proponents claim it is possible to write an astrological natal chart that reveals your basic nature. Furthermore, throughout your life the positions of the stars continue to influence your life, making it useful to consult your daily horoscope to find out what is going to happen and how you should approach the day. Astrology is used in a variety of ways and comes in many forms. One scholar writes that "It may be considered, depending on the definitions of all these words, to be magic, divination, a psychological tool, a religion, an art, or a science" (Campion 2016, 1). Astrology is thought to have emerged in Babylon in the second millennium BCE, as a simpler form of omen astrology tied to the calendar and the constellations. Evidence from surviving cuneiform tablets suggests that a natal astrology closer to today's horoscopes emerged sometime between the seventh and fourth centuries BCE (Holden 2006). Given its ancient origins, astrology has been remarkably successful. Gallup polls suggest that approximately 25 percent of adults in the United States, the U.K., and France believe in astrology (cited in Campion 2016). Furthermore, astrology is a kind of universal language and the material of horrible pick-up lines. By some estimates, fully 90 percent of adults know their astrological sun sign (Campion 2017).

Despite overwhelming evidence that astrology is based on a pseudo-scientific theory and is not a reliable measure of personality—much less a crystal ball into the future—this ancient form of divination has not diminished in popularity.

The Demographics of Belief

One of the most noteworthy aspects of belief in astrology is that it is more often embraced by liberals. A 2009 Pew Research Center study found that people who described themselves as liberal were almost twice as likely to say they believe in astrology than self-described conservatives: 30 percent of liberals compared to 16 percent of conservatives (Liu 2009). Similarly, a 2015 study using data from the General Social Survey and data of the National Opinion Research Survey at the University of Chicago found that conservatives were more likely to endorse the statement, "We trust too much in science and not enough in religious faith," and liberals were more likely to have consulted their daily horoscope or astrological profile (DellaPosta et al. 2015, 1482–1483).

According to the Pew study, belief is also more likely to be a youthful phenomenon, with the youngest age group, eighteen to twenty-nine year olds, having a 30 percent belief rate and belief decreasing with each increasing age bracket. Only 18 percent of those sixty-five and older endorsed astrology. Education was also systematically associated with lower levels of belief, with 18 percent of college graduates endorsing astrology, as compared to 30 percent of those with high school or less education. Finally, for both Protestants and Catholics, more frequent church attendance was related to lower levels of belief in astrology (Liu 2009).

The Psychology of Belief

Perhaps because astrology is so remarkably resilient, research on the psychology of belief has a long and continuing history. An early research contribution identified one of the reasons people tend to see themselves in their horoscopes—no matter what the horoscope says. The psychologist Paul Meehl named this the "Barnum effect," a reference to the famous motto attributed to P.T. Barnum: "There's a sucker born every minute." But the most famous early demonstration of the Barnum effect was done by Bertram Forer (Forer 1949; Meehl 1956). Forer gave a class of psychology students a personality questionnaire to fill out and then later handed out what the students assumed were unique personality sketches. In fact, all of the sketches were the same, and they were drawn from a newspaper stand astrology book. When asked to rate the accuracy of the sketches, the overwhelming majority found them to be to be remarkably accurate. James "The Amazing" Randi performed a very effective classroom demonstra-

James Randi performing a classroom demonstration of the Barnum effect.

tion of the Barnum effect in a PBS *NOVA* broadcast (Charlson 2000). It should be noted that horoscopes are particularly susceptible to the Barnum effect because they tend to be written in ambiguous, nonspecific terms that can be interpreted in many ways, but psychological tests are also prone to the Barnum effect (Wyman and Vyse 2008). An additional factor that has been implicated in the acceptance of horoscopes is whether the description is positive or negative. In a test using horoscopes that varied in their positive or negative valence, Hamilton (2001) found that—as you might expect—people were more willing to say their horoscope was valid if the description was generally positive; however, using a different method of testing with a German sample, Wunder (2003) found no effect of the favorableness of sun signs.

Astrology is a kind of universal language and the material of horrible pick-up lines. By some estimates, fully 90 percent of adults know their astrological sun sign.

For some time following Forer's study, most scientific investigations of astrology were tests of its validity (Tyson 1984; Carlson 1985; Hartmann et al. 2006). A group of studies tried to determine whether the person is recognizable in the description offered in the horoscope—similar to my student's honors thesis. In some cases, rather than having the individual pick out their own horoscope from a selection of horoscopes, the identification was made by a friend or relative who knew the target individual well (Tyson 1984), but this technique did not produce any better results. Another approach, used by Hartmann and colleagues (2006), was to administer a validated psychological test of personality to a large group of people and attempt to find any personality trait that was associated with the participants' astrological signs. This method also came up short. Thus, the overwhelming result of many studies is that horoscopes are not valid descriptions of personality.

One of the major explanations for belief in superstition is the desire for control over uncontrollable events (Vyse 2014), and a number of studies suggest that the desire for control is also an important factor in belief in astrology. For example, in a Finnish study, Outi Lillqvist and Marjaana Lindeman (1998) gave questionnaires to people who had signed up for adult education classes in either introduction to astrology, psychology, or German. Compared to students in the other classes, astrology students reported having recently experienced more life crises (e.g., divorce, infidelity, or a child leaving home). Interestingly, even among the control groups who took either psychology or German classes, those who reported greater belief in astrology also reported having experienced more life crises. So it appears that when people lose their footing and are shaken by the world, astrology provides a sense of order and control. In a laboratory study, American research participants were asked to judge how accurate a horoscope was, but before they made the judgment they were primed to have a sense of control or the lack of control. Half the participants were asked to recall a time when something happened to them and they were in control of the situation, and the other half was asked to remember a time when something happened but they were not in control. When later asked to judge the horoscopes, the "out of control" group reported that their horoscope was more accurate. Taken together, these studies point to astrology being used as a form of "compensatory control" to stabilize believers when they feel shaky (Landau et al. 2015).

The Ingredients for an Astrology Boom

It is not entirely clear that Beck's claim of a boom in astrology among millennials is true, as the evidence is mostly anecdotal. But if there really is a surge in belief among young people, the foregoing summary provides a few hints as to why. First, another recent Pew Research study shows that millennials are less religious than older generations but not less spiritual. In answering the question, "Religion is very important," only 41 percent of millennials said yes, in comparison to 59 percent of Baby Boomers. At the same time millennials were very similar to other generations on questions about having a sense of wonder in the universe, feelings of gratitude, and a concern for meaning and purpose (Alper 2015). So, for some younger people for whom traditional religion does not appeal, astrology may provide a spiritual outlet.

Second, two factors may be combining to make astrology more appealing at the moment: liberalism and a need for control. Astrology has a stronger appeal for liberals than conservatives, and in the United States, since the election in November 2016, the liberal world has been rocked. If ever there was a time when liberals might be looking for a compensatory sense of control, now is it. Conservatives are feeling better, but even if the tables were turned, the Pew survey data suggests they would be more likely to take refuge in religion rather than astrology or other forms of spirituality. If history of this moment has promoted belief in the paranormal, it would not be the first time. Earlier studies have shown an increased interest in astrology and other occult beliefs during periods of economic and political stress, such as in Germany during the 1930s (Padgett and Jorgenson 1982). Similarly, the "Secrets of the Psychics" *NOVA* program in which Randi demonstrated the Barnum effect was produced in response to a surge in interest in the paranormal in Russia following the fall of the Berlin Wall and the breakup of the Soviet Union.

Finally, we cannot overlook an obvious additional factor—the internet. There are fewer television commercials for telephone psychics these days, but the internet has exploded as a new vehicle for psychics and astrologers. Mil-

lennials are very adept at computers and smartphones, and the internet provides the opportunity to read a horoscope or consult an astrologer without fear of stigmatization or ridicule.

If, as I suspect, my student did not abandon astrology after uncovering evidence that it is a baseless pseudoscience (as further evidence for this hypothesis, I will point out that she gave me an astrology book when she graduated), there must be a very large audience for sun signs and natal charts. In addition, the rise of a generation that is not as traditionally religious as previous ones but is still seeking a kind of spiritual satisfaction, combined with the vanquishing of liberal politics in the United States and abroad, has created a fertile environment for this form of superstition and unreason. The current pseudoscientific storm may pass, but my student's story suggests that evidence alone may not be enough to turn believers into rationalists. ■

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[REALITY IS THE BEST MEDICINE HARRIET HALL

Harriet Hall, MD, also known as "The SkepDoc," is a retired family physician, a CSI fellow, and an editor of the *Science-Based Medicine* blog. Her website is www.skepdoc.info.

The Care and Feeding of the Vagina

We are pleased to introduce here a new regular column by Skeptical Inquirer *contributing editor and Committee for Skeptical Inquiry Fellow Harriet Hall, MD, well known and respected for her incisive writings on pseudoscience and pseudomedicine. She has titled her column "Reality Is the Best Medicine." —Editors*

The status of women in our society continues to improve. As the cigarette commercial says, "You've come a long way, baby." Indeed, it seems we now have Equal Opportunity Quackery.

Sex sells. It's always been a popular target for quackery, but the quackery used to be directed mainly at men. In the early twentieth century, Dr. John Brinkley made a lot of money promising to rejuvenate men by surgically implanting goat testicles into their scrotums. In addition to restoring their sexual potency, he claimed his treatments worked wonders on twenty-seven different ailments from emphysema to flatulence with a 95 percent success rate. His story is told in the entertaining book *Charlatan: America's Most Dangerous Huckster, the Man Who Pursued Him, and the Age of Flimflam* by Pope Brock.

More recently, we have seen our inboxes spammed with offers to enlarge penises and to cure erectile dysfunction with natural remedies without prescription drugs. Some of those remedies work … but only because they are illegally adulterated with prescription drugs! There were occasional offers aimed at women; for instance, claiming to enlarge their breasts with massage, exercise, and herbal supplements. Breasts are pretty obvious, so they were a natural target. Vaginas were a less obvious target: hidden from sight and not as socially acceptable as a topic of conversation. But lately it seems that vaginal quackery abounds.

The Vagina Is Self-Cleansing

There is no need for douching or other procedures to cleanse the vagina. It cleanses itself. (Just as the colon cleanses itself with no need for "detoxification" regimens. The idea that its walls are coated with years-old hamburger residue is preposterous.) Douching is not only unnecessary, but it can change the normal pH of the vagina and lead to infections and other problems.

Gwyneth Paltrow advocates steaming the vagina. She says, "You sit on what is essentially a mini-throne, and a combination of infrared and mugwort steam cleanses your uterus, et al. It is an energetic release—not just a steam douche—that balances female hormone levels." Experts have spoken out against it: there are no health benefits and a real possibility of harm.

Some women use Yoni oil to promote freshness, moisturize, and support vaginal health. There's even Ayurvedic yoni oil. It's said to treat infections, allergic reactions, hormone imbalance, herpes, dryness, and roughness. It also supposedly tightens the vagina and even treats ovarian cysts. There's even adaptogenic Holy Yoni Oil.

Admittedly, sometimes the vagina does require a bit of help. One of my most vivid memories of medical practice was when a woman came in complaining of a foul-smelling vaginal discharge. I removed a putrid, rotting tampon that she had forgotten to remove after her last period. I can't remember ever smelling a worse odor; that exam room was out of commission for hours afterward. But I didn't have to do anything but remove the tampon; her vagina took care of the rest. It cleansed itself and was soon back to normal.

Menstrual Superstitions

The vagina has been seen as "unclean" for centuries. The Roman author Pliny wrote: "Contact with the monthly flux of women turns new wine sour, makes crops wither, kills grafts, dries seeds in gardens, causes the fruit of trees to fall off, dims the bright surface of mirrors, dulls the edge of steel and the gleam of ivory, kills bees, rusts iron and bronze, and causes a horrible smell to fill the air."

In many societies, menstruating women were isolated in a special menstrual hut. In Nepal, the tradition of chhaupadi required them to stay in a cattle shed or makeshift hut, avoid any contact with men, and avoid eating certain

foods. Women have died from smoke inhalation and carbon monoxide poisoning in poorly ventilated huts, as well as from snakebite, rape, and wild animal attacks. The practice was banned by the Supreme Court of Nepal in 2005 but continues, and in 2017 Nepal passed a law imposing a fine and jail sentence on anyone who forces menstruating women into exile.

Orthodox Jewish women must take a ritual bath in a mikveh seven days after menstruation to restore them to a state of spiritual purity where they are ready to procreate. The restrictions mean they have no sex for half the month. To determine when menstruation has ceased, they insert a white niddah cloth into the vagina.

Things that Don't Belong in the Vagina

It's amazing what women will put into their vaginas. For vaginitis, they insert yogurt or yogurt-dipped tampons. For a yeast infection, they insert a whole or cut garlic clove. Proponents admit that this will irritate and burn normal tissue, but they claim it will cure an infection where the tissue is already irritated. There is a case report of a woman who put wood sticks in her vagina to terminate a pregnancy; the sticks migrated through the vaginal wall and resulted in hip pain.

Doctors have had to remove all kinds of foreign bodies from vaginas. In one published case, doctors removed an unidentified plastic foreign body with an aluminum rim, hexagonal in shape. The patient denied having put it there or knowing anything about it. In one woman they found a forgotten pessary; she couldn't remember ever having used a pessary. In another case, they found part of a flashlight that had apparently been inserted by the woman's rapist a year earlier. In another case, a pathologist examining a uterus specimen after a hysterectomy found a dead cricket in the uterine cavity. Really. It's in a published report in a medical journal, and there's a picture of it online. Searching for "dead cricket in uterus" will bring it right up on Google.

Women have put things in the vagina for health reasons, for sexual pleasure, to hide illegal drugs, or because of psychiatric disorders. In the 1700s, Mary Toft inserted live rabbits into her vagina to fool physicians into thinking she was giving birth to rabbits. Children insert objects in the course of exploring their bodies; they may not admit what they have done. Such things as pen caps, toys, and toilet paper have been found. I heard of one case where a toy train had been there so long, granulation tissue had grown in and out through the windows of the train. It was so embedded they had to remove the little girl's uterus to get it out.

Some misguided naturopaths have been using corrosive escharotics such as bloodroot salve in the vagina to treat precancerous lesions. They burn both normal and abnormal tissue and form a scab. Believe me, this is a *terrible* idea.

There were reports that college girls were inserting vodka-soaked tampons in an attempt to get drunk, but Snopes says that's just an urban legend. Women who put things in their vaginas would be well advised to remember the cautionary tale of toxic shock syndrome, where highly absorbent tampons led to serious strep and staph infections. They were eventually taken off the market after several women had died.

In another case, a pathologist examining a uterus specimen after a hysterectomy found a dead cricket in the uterine cavity. Really.

Jade Eggs and Other Quackery

There are herbal detox pearls, marijuana-infused vaginal pills, Japanese vagina-tightening sticks, and ground-up oak galls (abnormal growths that form when wasps lay larvae in branches). There are numerous brands of vaginal tightening gels, creams, pills, and sprays that promise to "make a woman a virgin again." One online columnist likened these practices to treating vaginas as "walls at which to throw medicinal spaghetti." There's not a scrap of evidence that they do anything good, and they're quite likely to do something bad, such as drying out the vaginal mucosa and causing an infection.

One of the most notorious vaginal quackeries is Gwyneth Paltrow's jade eggs. Yes, she wants you to stick a $66 rock up there. You can even "breathe passion" into your jade egg practice with Yoni Breathing to increase your life force energy. She says jade eggs are an ancient guarded secret of Chinese concubines. She says it will detox, improve your sex life, balance your menstrual cycle, and intensify feminine energy. No, it won't. And the porous rock might harbor bacteria. Gynecologist Jen Gunther has published an open letter to Paltrow explaining why her vaginal jade eggs are a bad idea.

Paltrow also warns against toxins in tampons. There are no toxins in tampons. One quack alternative to tampons is sanitary napkins embedded with anion strips. The enhanced embedded anion-chip and far infrared ray function inhibits bacteria, increases the growth of bioenzyme, and regulates acidic secretions in the vagina. It emits biological magnetic waves and activates water molecules in the cells. This is just meaningless pseudoscientific blather, or perhaps it would be more appropriate to call it twa(t)ddle.

Invasive Quackery

Nuvell Clinics offer an O-Shot Orgasm Shot, injecting your own platelet-rich plasma (PRP) into the upper vagina and into an area near the clitoris, to allegedly give you better orgasms. And then there's elective vaginal reconstruction or rejuvenation surgery to create the "designer vagina." American, Australian, and Canadian professional organizations of gynecologists have spoken out against this risky operation.

The Bottom Line

Vaginas needn't be fed with garlic or yogurt or jade eggs or anything else. They don't need cleansing with douches or anything else. Any advice to the contrary is quackery until proven otherwise. ■

[SKEPTICAL INQUIREE BENJAMIN RADFORD

Benjamin Radford is a research fellow at the Committee for Skeptical Inquiry and author or coauthor of ten books, including *Investigating Ghosts: The Scientific Search for Spirits*.

Caught Between the Possible and the Paranormal

Q: **Have you ever come across any research, findings, or reports that have shaken your stance about the validity of skeptical explanations for mysterious claims? In other words, have any cases stumped you?**

—J. Meuse

A: I've often been asked if, in the course of my research into myriad mysteries and seemingly paranormal events, whether I've ever encountered something I couldn't explain. It's a fair and understandable question, but one that's difficult to answer. There are a couple responses: a concise one (which can easily come off as arrogant) and a more nuanced one.

It's a fair and understandable question, but one that's difficult to answer. There are a couple responses: a concise one and a more nuanced one.

The short answer is no; I haven't really found any hard evidence of any paranormal claims or anything I didn't sincerely believe likely had a mundane explanation based on the evidence. There are certainly times when, during the course of an investigation, some aspect of a phenomenon wasn't understood or explained. I've been temporarily stumped by specific claims on some cases, but in the end I figured them out. One example appeared in my investigation into a haunted house in Buffalo, New York (for details see chapter 5 in my book *Scientific Paranormal Investigation: How to Solve Unexplained Mysteries*). I had investigated—and solved—most of the "haunting" phenomena with the exception of perhaps the most baffling one: a man who claimed he'd been physically attacked by a ghost. I was eventually able to solve the mystery and determine what had happened to him, but if not for a lucky coincidence (I mentioned the case to a friend's wife, who recognized the cause) it might have remained a mystery.

I tend to choose the best cases to investigate, ones that have good evidence available for them. I don't want to waste my time focusing on flimsy or insignificant cases. There's a positive correlation between the quality of the available evidence and solving the mystery; just like in crime scenes, the more evidence an investigator has, the more likely the case will be solved. Take a homicide, for example: If a victim is found in a rural area months or years after his death, the evidence will have greatly degraded due to predators, environmental exposure, and so on. If the victim is instead found within minutes in an urban area, there is a far greater likelihood of solving the crime with many potential eyewitnesses, cameras, a fresh corpse, easily established cause of death, and so on. The quality and quantity of the evidence is often the key difference between a solved case and an unsolved one—not because some deaths are "unexplainable" or inherently unsolvable.

My time is better spent investigating a famous lake monster photograph or researching the "best case" for psychic detectives (see "The Psychic and the Serial Killer: Examining the 'Best Case' for Psychic Detectives," Skeptical Inquirer March/April 2010), for example, than digging into an unknown, ambiguous case with little ex-

ternal relevance ("I was camping alone in the Rocky Mountains in the summer of 1983 and saw a strange yellow light shoot up into the night sky and fly away. Can you explain it?"). After all, if the best evidence can be plausibly solved through careful investigation, what does that say about mysteries with poorer evidence?

Picking cases with adequate evidence should not be confused with choosing the "easy" cases. Doing real investigation into seemingly mysterious phenomena takes time, preparation, effort, and sometimes a significant amount of money. Some investigations I've done have taken only a few minutes, while others take days or even weeks. A few have taken months, and a handful—such as my chupacabra research—have taken years. Often a mystery remains unsolved for the simple reason that researchers don't put in the time and effort required to find solutions. If you give up before you find the answer (or barely bother to look because you're convinced of a supernatural explanation ahead of investigation), then of course the "unexplained" will remain so.

Being a successful investigator of mysteries, whether seemingly normal or paranormal, is—in my case, anyway—less a matter of brilliance or investigative acumen than persistence. It's finding approaches to gathering and analyzing evidence long after most amateur ghost hunters or paranormal investigators have gotten bored or given up. Skeptical investigators make a comprehensive list of possible explanations and carefully examine the evidence to rule them out one at a time, beginning with the most likely. Some explanations can be dismissed immediately because of the circumstances, while others may take significant research (interviews, archival reviews, experiments, etc.) to determine their viability. Because most nonscientific investigators don't trouble themselves with thoroughly exploring alternative hypotheses, their "investigations" are often superficial, thus resulting in a mystery being deemed "unexplained" or "paranormal."

For example, if an empty rocking chair is seen on camera moving slightly in a supposedly haunted location and a ghost hunter assumes it's either a hoax, a ghost, or an unseen breeze, then a few quick examinations could pretty quickly rule out a hoax (video cameras show no one was in the house) or a breeze (all doors and windows were shut and locked), leaving an unseen spirit assumed to be the responsible party. However, a science-based investigator might consider these and other explanations as well: perhaps the chair was not in fact moving but merely *appeared* to be moving as an artifact of a low-resolution, low-light camera or moving shadows; perhaps vibrations from a heavy truck on a road outside caused the movement; and so on. The specifics would depend on the circumstances. If you can think of only one or two possibilities (or ways to investigate those explanations), then once you've exhausted those you're likely to call it "unexplained."

I tend to choose the best cases to investigate, ones that have good evidence available for them. I don't want to waste my time focusing on flimsy or insignificant cases.

Because the variety of investigative techniques are limited by the researcher's knowledge and resources, those who have significant experience and follow scientific methods are more likely to find solutions and thus solve mysteries than those who do not. Like any other toolkit, the more tools you have (mostly in the form of scientific principles), the better able you will be to fix a problem or find a solution. In real-world investigations, information is often incomplete or fragmentary, for many reasons: eyewitnesses can be mistaken, records can be lost, forgeries can go undetected, etc. There is often no way to know with absolute certainty what happened in any event; even videotaped recordings can be hotly debated and offer polarized interpretations. Science does not operate on certainties but instead on what fits the facts, what is most likely and probable. Most ghost hunters and paranormal investigators, on the other hand, are under no such evidentiary constraints.

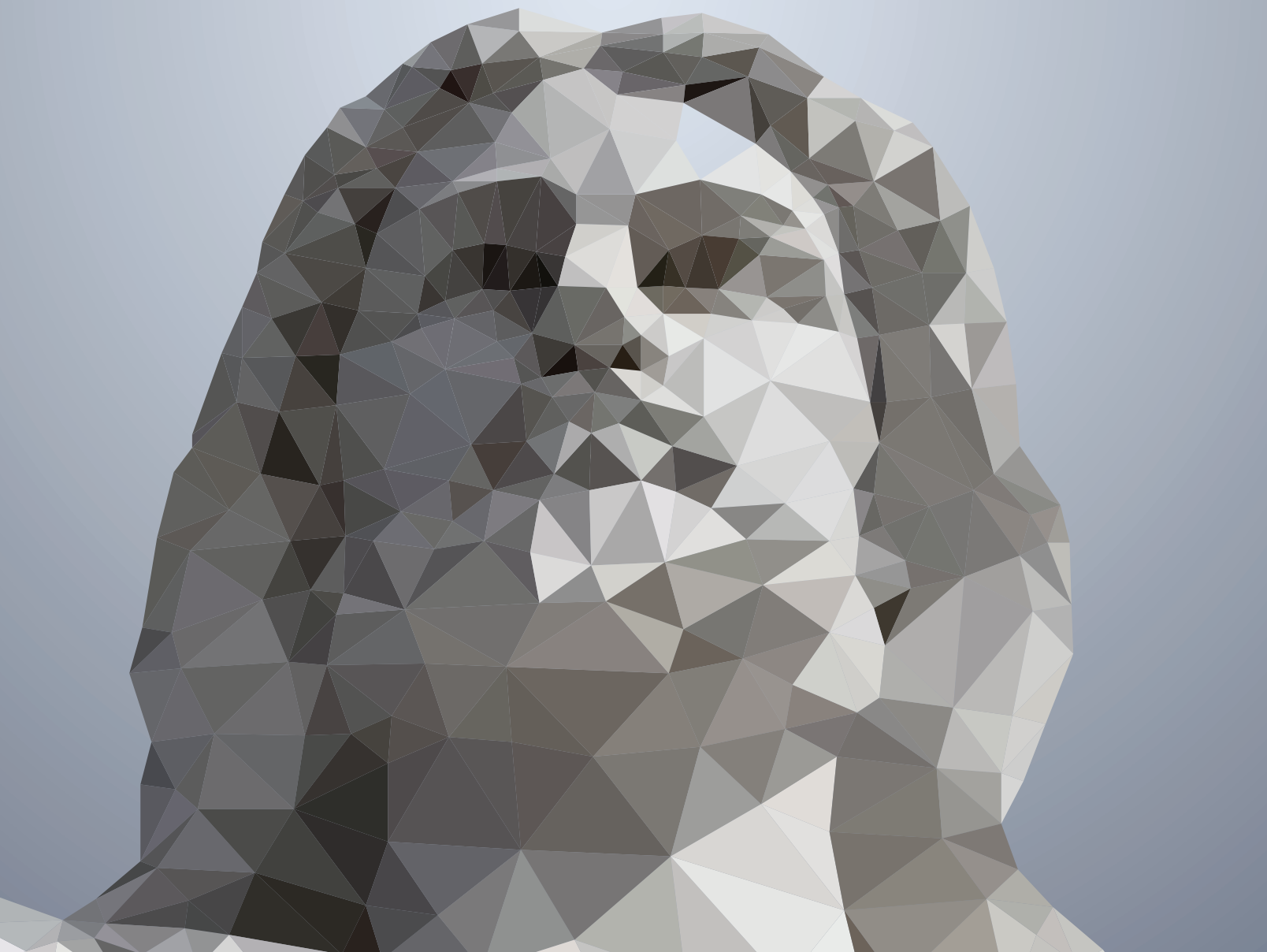
As a skeptical investigator who often employs Occam's Razor to whittle claims down to size, I have a high bar for what I am willing to concede is "unexplained" or truly mysterious. It's not that I have a vested interest or deep personal investment in empiricism, materialism, or what might dismissively be called scientism in refusing to acknowledge some unknown event, but instead that I've spent two decades learning about potential paranormal doppelgangers and the ways in which we can be fooled (and how we fool ourselves). We must first plausibly eliminate those alternative explanations before accepting supernatural ones. It would take just one recovered Bigfoot body, a single extraterrestrial crash in Manhattan, or a verified case of a psychic leading police to a missing kidnapping victim to offer strong evidence. Nothing would please me more than to prove to astonished scientists that ghosts exist or that blood-sucking chupacabras lurk in rural Puerto Rico. Perhaps one day these and other "unexplained" topics will be scientifically verified, but until then I can't honestly say I'm stumped. ■

Update: In a previous column (January/February 2018) I responded to a query about the claimed appearance of Elvis Presley as a background extra in the film *Home Alone*. I offered an analysis of the conspiracy theory and reasons to be skeptical of the claim but did not track down the identity of the actor in question. Intrepid investigator Kenny Biddle took up the challenge and definitively identified the (accidental) Elvis impersonator as Gary Grott.

THE GOD ENGINE

Belief in the supernatural develops as a natural consequence of the way our brains work, so it should be no surprise that religion is both pervasive and enduring.

JAMES E. ALCOCK



This article is a modified excerpt from Chapter 16, "The God Engine," in *Belief: What It Means to Believe and Why Our Convictions Are So Compelling* (Prometheus Books, 2018).

There are more than 10,000 religions in the world today, and while most involve relatively small numbers of devotees, the major ones each encompass hundreds of millions of followers. Almost nothing seems too bizarre to be incorporated into religious belief, but what may appear strange to the outsider does not seem so to the faithful. Consider:

- If you think it bizarre to abandon the bodies of deceased loved ones atop tall towers to be devoured by birds, then you probably were not reared as one of the world's 2.6 million Zoroastrians.
- If you think it absurd to believe that diseases are caused not by germs, bacilli, or viruses but instead by lapses of faith, then you probably were not reared as one of the world's 150,000 Christian Scientists.
- If you think it strange to believe that humans are the descendants of Thetans, a group of omnipotent gods, and that our emotional problems are due to "engrams" in the brain created by traumas in prior lives on another planet, then you probably were not reared as one of the world's 500,000 Scientologists.
- If you think it weird to worship a god with the head of an elephant or in the worship of another god, Shiva, to rub clarified butter on a temple *lingam* that is considered by some scholars to be a stylized phallus, then you probably were not reared as one of the world's one billion Hindus.
- If you think it curious to wave silk or paper streamers ("nusa") over someone in a rite of purification or for new car owners to take their cars to a shrine to be prayed over and purified, then you probably were not reared as one of the world's 2,700,000 Shintos.
- If you think it peculiar to snip away the foreskins of baby boys in the service of religious faith, then you probably were not reared as one of the world's 14 million Jews or 1.6 billion Muslims.
- If you think it odd for priests to wear masks over their mouths to avoid breathing in and killing microorganisms, then you probably were not reared as one of the world's 4.2 million Jains.
- If you think it inconceivable that "ancient Hebrews of America" buried golden tablets written in Egyptian in a hillside in the United States and that these were later recovered and translated with the help of an angel, then you probably were not reared as one of the world's 15 million Mormons.
- If you think it horrifying that parents, in the name of religion, deny lifesaving blood transfusions to their dying children, then you probably were not reared as one of the world's 7.1 million Jehovah's Witnesses.
- If you think it shocking to celebrate one's faith by eating the flesh and blood of one's heavenly savior through a spiritual transformation of bread and wine (symbolical or literal depending on your sect), then you probably were not reared as one of the world's 2.2 billion Christians.

Whatever its form, religion is powerful and pervasive and, for billions of people, obviously important. Yet, while major religions such as Islam, Christianity, Hinduism, and Buddhism have endured since ancient times, others, despite having enjoyed great appeal for centuries, have disappeared into the history books. No longer does anyone worship Zeus, the supreme god of the ancient Greeks; Marduk, the Babylonian god of creation; Bast, the Egyptian goddess of protection; Jupiter, the supreme god of the Romans; the Incan Apocatequil; or the Aztec Huehueteotl. Those bygone gods were central figures in highly developed theocracies and were as real to their devotees as are today's deities to contemporary worshippers.

The continuing power of religious belief in all its many contradictory forms suggests that it serves important functions. Indeed, some researchers consider religion to have become culturally important because fear of the deity promoted social solidarity, cooperation, trust, and self-sacrifice. Important behaviors were either mandated or declared taboo by religion, and believers had little choice but to accept that a powerful supernatural being had deemed them so. This social control in turn increased the likelihood of the survival and reproduction of individuals as well as the long-term survival of the group itself. As religion became deeply established within a group, the religious beliefs and rituals taught to young people contributed an important part of their social identities, and their corresponding roles and duties further contributed to the functioning and cohesiveness of the group.

However, the prevailing view in modern psychology is that religious belief developed not because of those functions but rather as the automatic byproduct of brain systems that evolved for everyday cognition. That is, belief in the supernatural is a natural consequence of the way our brains work, a product of a metaphorical "God Engine" that endows it both with significant power over the lives of people and the groups to which they belong and with strong resistance to change. In other words, a number of automatic processes and cognitive biases combine to make supernatural belief the automatic default.

Whatever its form, religion is powerful and pervasive and, for billions of people, obviously important.

Components of the God Engine

A number of elements of this "God Engine" are particularly important in the development of religious belief:

We are born magical thinkers. Magical thinking—assuming some magical causation between an assumed cause and its effect—plays such a significant role in religion that some researchers consider it to be the very foundation of religious belief. Suppose that the sky darkens with the approach of a frightening thunderstorm. Someone importunes Zeus to send the storm away, and, by coincidence, the storm abates. Fear is reduced, the action of praying has been reinforced, and Zeus is credited with having quieted the storm.

We are born agency detectors. From a very early age, we look for reasons and intentions, for agency, behind threatening or awe-inspiring events. Failure to identify a cause can lead to the conclusion that the agent is present but invisible, resulting in increased belief in undetectable agencies. And because people everywhere have similar experiences, beliefs in supernatural beings—gods, ghosts, angels, and demons—have developed in every culture and society. Interpreting events as divine interventions, messages, warnings, or punishments serves as further confirmation of the existence of the divine being. Indeed, in every society that anthropologists have examined, uncontrollable tragedies have been viewed by many people as having been deliberately caused by some supernatural agent. An unexpected and violent storm may be interpreted as an expression of God's wrath in response to some transgression. The epidemic of HIV/AIDS was taken by some fundamentalist Christians in the United States to be God's punishment for homosexuality.

There are only a limited number of attributes that can be reasonably associated with a hypothetical supernatural agent, and therefore it is not surprising that many similarities are apparent among the supernatural beings envisioned by peoples around the planet. For example, we might attribute to a supernatural being counterintuitive physical properties such as being a ghost, counterintuitive biological properties such as never aging or dying, or counterintuitive psychological properties such as prescience or extraordinary perception. However, not all possible combina-

tions of such abilities are likely to persist in the belief system or be passed on to subsequent generations. The representations of supernatural beings that persist are recognizable, easily remembered, easily communicated, and useful in dealing with problems. Examination of a wide variety of mythologies, anecdotes, cartoons, religious writings, and science fiction bears testament to this.

We develop theory of mind. Infants become able to distinguish between animate and inanimate objects by five months of age. This is followed by the development of *theory of mind* sometime before the third year as children come to understand that humans and animals have internal mental processes similar to their own. This leads directly to *dualism*, the notion that mind is separate from matter, which in turn paves the way for belief in disembodied spirits and intelligent deities whose minds function in a similar manner to our own. As a result, it should not be surprising that about half of all four-year-olds have an imaginary friend. Some cleverly designed experiments have shown that children's concepts of gods are not simply extensions of their concepts of what people are like. Being godlike involves powers that go beyond human capability.

We develop promiscuous teleological intuition. As they reason about the world around them, children appear innately prone to consider objects and events as serving an intentional purpose, and this teleological bias to perceive that things happen for a reason operates promiscuously (in that it is applied to just about everything). Of course, such reasoning eventually leads to contemplation about some sort of extraordinary intelligence that guides the world and belief in supernatural creation (Kelemen 2004).

A number of automatic processes and cognitive biases combine to make supernatural belief the automatic default.

Reality testing. Children have to learn to distinguish fantasy from reality. They learn that nightmares are not real, that the tooth fairy and Easter bunny are fictions, and that Santa Claus does not exist. Yet, where religious beliefs are concerned, religious parents not only do not teach their children to reality test, they typically teach them *not* to reality test. They are taught that religious beliefs are justified by faith alone and are not to be subjected to reason. In the more fundamentalist religions, children are further taught that it is not only inappropriate but sinful to question religious teachings, and the resultant guilt aroused by any doubts about their religion is a powerful deterrent to future intellectual challenges. In consequence, these beliefs may remain forever insulated from reality testing and therefore may be very unlikely to change.

Compare belief in Santa Claus with belief in a deity (see figure below). Both beliefs are communicated to children at a time when their ability to reason is undeveloped. Both beliefs involve physically impossible feats and make no logical sense. Both beliefs are typically shared by the child's peers, but while all adults look askance at any twelve-year-old who still believes in Santa Claus, religious parents look askance at the twelve-year-old who no longer believes in the deity.

As children strive to make distinctions between reality and fantasy, making wishes comes easily to them. Note that praying and making a wish are very similar, for each involves a mental process intended to bring about some desired outcome without any physical effort on one's own part. While praying is part of a system of *institutionalized* magical beliefs (religion) taught by adults and shared with family, wish-making is something that one does inde-

	Santa Claus	Deity
Taught to young children at an age when critical faculties are underdeveloped	✓	✓
Involves physically impossible feats	Climbs down chimneys Flying reindeer Delivers gifts around the world in a single night	Hears all prayers simultaneously Visits Earth as human or animal Transcends space, time, and physical laws
Makes no logical sense	Child is too young to question	It is a matter of faith; Logic is inappropriate
Belief is shared by peers, providing social support	✓	✓
Outgrowing the belief is a sign of maturity	✓	✗

pendently of others; it is *non-institutionalized*. When family and cultural influences support and encourage religious beliefs while discouraging and disparaging other magical beliefs, children, at some time between ages four and eight years, come to view praying and wish-making quite differently. They typically show both increasing belief in the power of prayer and decreasing confidence in the effectiveness of personal idiosyncratic magical beliefs, including wishing (Woolley 2000).

We are more likely to remember "ontological" violations. Children develop an intuitive ontology—an understanding about what exists, about what is real—early in life. An *ontological violation* is something that it is considered impossible in the normal world, such as waving one's arms in order to fly. Of course, many religious beliefs involve ontological violations—such as an omniscient deity who can hear people's prayers wherever they may be in the world.

The representations of supernatural beings that persist are recognizable, easily remembered, easily communicated, and useful in dealing with problems.

We are taught religion. Children do not become Christians, Muslims, Buddhists, or Jews on their own. They learn religion, which is intertwined with a group's history and culture. The development of language ability not only gives the growing child a powerful tool for the symbolic analysis of events, it also makes possible the acquisition of massive amounts of information from others. Children learn much about the world through their own experiences, but when it comes to things they cannot observe directly—for example, their internal organs, the shape of the Earth, or the revolution of the Earth around the Sun—they uncritically accept the teachings of adults. It is therefore not surprising that they uncritically accept religious teaching about invisible entities that they cannot observe directly.

Violations of ontological expectations are better remembered than beliefs that intuitively make sense. For example, "a man who walked through a wall" is an ontological violation, while "a man with six fingers," although unusual, does not violate our beliefs about what is possible and what is not. Research has found that reference to a man who walked through a wall is recalled more readily over a period of months than reference to a six-fingered man. This effect has been found not only in the West but also in Tibet and with the Fang people, a Bantu tribe in Gabon (Boyer 2001).

Religious beliefs involving violations of our intuitive (ontological) understanding of the world are both attention-grabbing and memorable. Because they are more memorable, they are also more likely to be communicated to others. The advantage that a memorable idea has in terms of being transmitted from generation to generation may be small, but over many generations its influence is amplified as it becomes an inherent part of the culture. Psychologist Pascal Boyer points out that although individuals and groups can be credulous at times, there are limits to what people will believe in the name of religion, and so only certain religious beliefs, those that provide solace or offer explanations for strange events, are likely to be transmitted over extended periods of time. While something too counterintuitive (e.g., a species of super-intelligent beetles that control television networks) may not take hold, the notion of a god who possesses some human qualities but also has omniscience and prescience may be just counterintuitive enough but not too much. Boyer also points out that it does not take much effort to maintain religious beliefs, and that people do not have to work very hard to persuade themselves that these beliefs are true.

Persistence of Religious Belief

While supernatural belief is a natural byproduct of normal cognitive development, such belief is supported through experiences that seem to offer verification:

To sleep, perhaps to dream. There is considerable evidence, both cross-cultural and historical, that dreams provide people with what seems to be verification of their beliefs in supernatural beings and life after death and contribute to the development of religious rituals, beliefs, and concepts of the divine.

Emotional experience. While each religion has its own set of beliefs and practices, and while the major religions are guided

by holy texts supposedly divinely dictated or inspired eons ago, religion is much more than a set of dictates and beliefs, for strong emotional experience is often involved. It is one thing to debate the appeal of various religious beliefs and it is quite another to "experience" the divine. Many religious people have reported having felt the power of a divine presence, often during prayer. Some religions deliberately encourage such experiences, and the resurgence of charismatic and Pentecostal Christianity, sometimes involving speaking in tongues and laying on of hands, attests to the appeal of a mixture of emotion and spirituality.

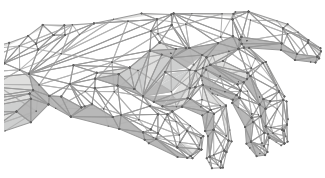
Religion answers existential questions. Why are we here, and what happens when we die? Where did the world come from, and when did it begin? Religion provides answers to many questions that otherwise would go unanswered. Consider these creation stories:

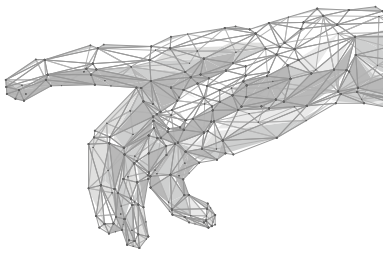
> *Creation story #1* (King James Bible, Book of Genesis):
> In the beginning, God created the heaven and the earth. And the earth was without form, and void; and darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters. And God said, Let there be light: and there was light. And God saw the light, that it was good: and God divided the light from the darkness. And God called the light Day, and the darkness he called Night. And the evening and the morning were the first day.
>
> *Creation story #2*: (Native North American, *Achomawi*):
> In the beginning, all was water. Then a cloud formed in the clear sky, became lumpy and turned into Coyote. Then a fog developed and became lumpy and Silver Fox was formed, and then Coyote and Silver Fox both became people. And they began to think. And they thought a canoe, and it became real and they floated in it for many years. One time while Coyote was sleeping, Silver Fox combed his hair and then took the combings, flattened them and spread them out on the water until they covered the surface of the water. Then he thought, "There should be a tree," and now there was a tree. And then he did the same with shrubs and rocks and people and birds and fish.
>
> *Creation story #3:* (The big bang, modern science)
> About 13.8 billion years ago, a singularity, an infinitesimally small point of infinite density, suddenly exploded and began to expand rapidly to form the universe as we now know it, with a diameter at present of some 93 billion light-years and still expanding. (That is, light emanating from one edge of the universe would take 93 billion years to reach the other edge.) The universe is estimated to contain between 100 and 200 billion galaxies, with each galaxy comprising hundreds of billions of stars.

All three stories may seem fantastical in their own way, and all three are held on trust by those who believe them. While the first involves trust in the validity of the Book of Genesis and the second in the oral traditions of North American First Nations peoples, the third requires trust in the conclusions of modern science. While scientists understand the logic and the data that support the big bang explanation, it is beyond the layperson's ability to do so.

Such explanations provide a feeling of understanding to people puzzled about how the world began, even though they leave other mysteries in their wake. Those who attribute the origins of the universe to their god or gods conveniently ignore the question about where their god or gods came from. On the other hand, the big bang explanation also leads to another mystery: the origin of that singularity.

Reinforcement of religious belief. Religious beliefs are reinforced in a number of ways. As mentioned above, many religious people believe that they have experienced a divine presence, often during prayer. In addition, no matter to which god one prays, subsequent events that would have occurred whether one prayed or not can often be interpreted as the desired answers to one's prayers. After all, even without divine intervention, people sometimes unexpectedly recover from severe illness; rains do come to end





droughts; lost loved ones are found safe; and people do get promotions at work. However, when preceded by prayer, these events may appear to be miraculous. And the gods cannot lose, for any apparent failure of prayer is generally explained away: "Sometimes, God says no."

Second, religion provides a bulwark against existential anxiety and fear of annihilation. It offers comfort in times of threat and can help one to deal with the loss of loved ones, especially if one believes that our personalities survive death. Religious belief and prayer also offer an important shift in focus when faced with anxiety and uncertainty. When under stress, people with strong religious conviction show less reactivity in the part of the brain associated with anxiety. The framework that religion provides can help an individual to remain calm and to deal with difficult circumstances. Of course, an emotionally balanced atheist with a good sense of purpose might react similarly.

Third, religion can provide an increased sense of control. Religion not only serves to reduce anxiety, for belief in a benevolent god who watches over the world and answers prayers provides a sense of control when all around us is chaos and calamity. "God is in His heaven—All's right with the world." As a result, belief in God typically increases when people are under extreme levels of stress. Reflecting this, researchers have found that both in Western and non-Western contexts, pronounced government instability is associated with increased religious belief.

Fourth, religion can provide companionship that goes beyond being a member of a congregation. Many religious people form strong emotional attachments to their deity. Such attachment may either mirror strong feelings of childhood closeness to parents or compensate for unsatisfactory relationships with parents. Further, if one believes in a god who listens and watches over us, this belief provides a sense of never being alone. This is very important in a world where loneliness is a significant problem for many.

Fifth, religion is often a source of significant self-enhancement. "God sees the little sparrow fall ... I know he loves me too." Perhaps you feel unimportant or ignored or rejected, but if you know that your God loves you, this gives you a reason to feel good about yourself.

Sixth, religion contributes to group identity. Religion does not occur in a social vacuum. Religious beliefs and practices are shared and reinforced by family, friends, and neighbors and provide an important basis for social identification. Adherents feel themselves to be part of a moral community with its sacred values, norms, and ethical expectations. Religious identity provides something that no other social identity can offer: a sense of eternal belonging and a set of sacred beliefs that provide certainty about the world and one's place in it. These unique characteristics, combined with powerful emotional experiences and strong bonds with other members, imbue it with more importance to many people than any other form of social identity.

While for some, childhood religious belief ultimately succumbs to critical thinking, for many others it is excluded from critical analysis and is instead accepted on faith as being uncorrupted truth.

In conclusion, belief in the supernatural is a natural consequence of normal cognitive development, and so it should be no surprise that religion is both pervasive and enduring. While for some, childhood religious belief ultimately succumbs to critical thinking, for many others it is excluded from critical analysis and is instead accepted on faith as being uncorrupted truth. And then no matter which presumed deity is worshipped—a god with the head of an elephant, a god who throws thunderbolts from the sky, or a god who comes to Earth in human form—many events and personal experiences will serve up apparent confirmation that the deity is real. ■

Note

Detailed citations are provided in the original book chapter.

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From the Spectral to the Spectrum

Radiation in the Crosshairs

Public attitudes about radiation, shaped by a rich history of mythology from biblical times to the modern events of Chernobyl and Fukushima, impact personal lives and decisions, but they also have global existential implications.

JEANNE GOLDBERG

Wilhelm Conrad Roentgen shocked the world in 1895 when he produced the first radiograph of the human body: an X-ray of his wife's hand. Whether intentional or not, the fact that he chose her hand for this epic experiment was fitting because the hand has, through the ages, been an important cultural symbol. In this case, the radiograph of Anna Roentgen's hand signaled a landmark scientific achievement that was rapidly adopted in many countries.

Roentgen's discovery occurred during the Victorian Era, a time when other scientific discoveries such as the telegraph, photography, the electric light bulb, the telephone, and radio were made, to name just a few. The Victorian Era, extending from 1837 to 1901, was characterized at the beginning by the strong, pervasive religion of the Church of England. The tension between religion and science was minimal in the early years. As Aileen Fyfe noted, "… religious faith and the sciences were generally seen to be in beautiful accordance … mediated by some form of theology of nature" (Fyfe 2012). This era was one of increasingly robust scientific activity, however, and as the twentieth century approached, the tension between science and religion intensified. Some scientists began to express their opposition to the dogma of Christianity while simultaneously a culture of scientific romanticism thrived. The fact that the general public often didn't understand the scientific bases for the discoveries contributed to suspicion and paranormal explanations.

Interestingly, Roentgen's discovery of radiography provided one of the focal areas of convergence of the scientific discipline of *physics* with this *psychic*, romantic, paranormal, pseudoscientific movement. Keith Williams, in the article "Ghosts from the Machine: Technologisation of the Uncanny in H. G. Wells" describes the ambivalent feelings of Victorians (the anxieties in addition to the optimism) as scientific discoveries were made. Knowledge of the electromagnetic spectrum enabled the understanding of visible light and color; however, the fact that some of the waves on the spectrum were invisible and could penetrate solid substances (e.g., X-rays) kindled a combination of fascination, fear, and "otherworldly" images. Williams refers to H.G. Wells's 1898 book *The Invisible Man* and his other writings as examples of a "strange liaison between spiritualism and science." In fact, the Society for Psychical Research (SPR), founded in 1882, whose membership consisted of scientists and philosophers, was an example of this type of liaison (Williams 2010).

Print of Wilhelm Röntgen's first "medical" X-ray, of his wife's hand, taken on December 22, 1895, and presented to Ludwig Zehnder of the Physik Institut, University of Freiburg, on January 1, 1896.

Bettyann Holtzman Kevles states in *Naked to the Bone: Medical Imaging in the Twentieth Century* that "it is a historical irony that the discovery of rays that could penetrate clothing and skin and leave an image of living bones appeared in the most inhibited period in Western history, an era whose name Victorian has become synonymous with extreme sexual repression and bodily shame … the discov-

Interestingly, Roentgen's discovery of radiography provided one of the focal areas of convergence of the scientific discipline of *physics* with this *psychic*, romantic, paranormal, pseudoscientific movement.

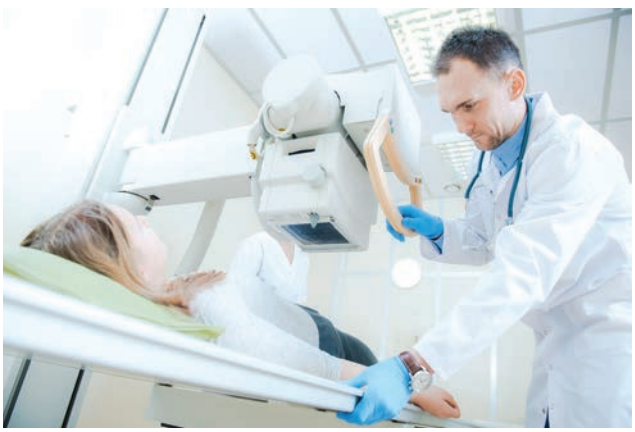
ery of X-rays was one of the nails in the coffin of Victorian prudery" (Kevles 1998).

That historical account is intriguing, but it is also relevant to public opinion concerning various types of radiation that play central roles in our lives today. Radio, TV, mobile phones, microwave ovens, smoke detectors, and X-rays represent scientific applications of the electromagnetic spectrum that have transformed our lives. Although these technologies are widely used, nevertheless the public has expressed concern from time to time about the safety of cell phones and electromagnetic field radiation.

Public perceptions of the risks and benefits of ionizing radiation have been influenced by many factors. Hiroshima and Nagasaki were monumental events, of course, and the destructive capability of the atom was forever etched in the public mindset.

Briefly, electromagnetic radiation can be described as photons or massless particles traveling in a wave pattern at the speed of light. A range or spectrum of electromagnetic energy levels progressively extends from relatively low energy radio waves to microwave, infrared, visible, ultraviolet, X-ray, and gamma ray radiation at the high energy end.

The simple word *radiation* applies to the spreading out or transmission of energy, but to many individuals it refers to the more specific term *ionizing radiation*. X-rays and gamma rays (and alpha and beta particles), at the high energy end of the electromagnetic spectrum, are capable of ejecting electrons from their orbit around atoms or molecules, thereby creating ions. The radiation produced by X-ray machines is differentially absorbed in human tissues and in different materials, when used for industrial purposes, thereby generating images (NASA 2013).



Without delving into a detailed discussion of the specific units used to measure radiation absorption in humans, suffice it to say that the *sievert* (Sv) is a basic unit that is indicative of the relative biological effectiveness (RBE), the sensitivity of tissues to radiation exposure averaged over the body (Gregersen 1998). The sievert is roughly equivalent in biological effectiveness to a radiation absorbed dose of one *gray* (100 rads) of gamma radiation. The average American receives about 6.2 millisievert (mSv) per year (U.S.NRC 2017).

Half of the radiation dose (3 mSv) that the average American receives each year is natural background radiation, originating mostly from radon but also from cosmic rays and even our food and water. An airplane coast-to-coast trip can contribute 0.03 mSv to our exposure, and living in high plateaus of New Mexico or Colorado can contribute 1.5 mSv more radiation annually than would be the case if one lived near sea level (Radiology Info 2017).

Not surprisingly, public perceptions of the risks and benefits of ionizing radiation have been influenced by many factors. Hiroshima and Nagasaki were monumental events, of course, and the destructive capability of the atom was forever etched in the public mindset. The emotional overlay of the events dominated rational analysis. For example, although the average dose to the exposed individuals was approximately 200 mSv (Hendee and O'Connor 2012), there was limited public recognition of the fact that this large dose occurred at one time, not in smaller doses distributed over a longer period of time.

More recent nuclear disasters at Chernobyl and Fukushima have reinforced the public's concerns regarding medical diagnostic imaging studies, nuclear power, and even food irradiation. Individuals inappropriately extrapolate the risks of being subjected to high levels of radiation from a nuclear disaster to the risks of submitting to a low dose X-ray imaging study. Undergoing an imaging study can lead to an unsuspected diagnosis and detection of disease at a curable stage, but it can also lead to an unsuspected diagnosis or detection of disease at a curable stage.

In spite of these concerns, the value of plain X-rays, computed tomography (CT), and other imaging studies that use ionizing radiation is largely recognized by the American public. In the United States, 800 million radiologic exams are performed annually (Ip 2017). Medical and dental X-ray

Procedure	Dose	Time
Chest X-ray	0.1 mSv	ten days
CT Pelvis and Abdomen, performed with and without contrast material	20 mSv	seven years
CT Head, performed with and without contrast material	4mSv	sixteen months
CT Colonography	6 mSv	two years
X-ray Spine	1.5 mSv	six months
CT Spine	6 mSv	two years
Mammography	0.4 mSv	seven weeks

Figure 1.

procedures account for approximately 90 percent of the population dose from artificial sources of radiation (Phenomenon Called Radiation 1979). In 2006 the yearly per capita average radiation dose in the United States was 6.2 mSv, compared to a dose of 3.6 mSv in the early 1980s, with medical radiation being responsible for this increase (Hendee and O'Connor 2012).

Of interest are the approximate radiation doses from imaging studies and the approximate length of time that would be necessary for one to receive the comparable dose from natural background radiation (see Figure 1) (Radiology Info 2017).

In an excellent review article published in 2012 in *Radiology* titled "Radiation Risks of Medical Imaging: Separating Fact from Fantasy," William Hendee and Michael O'Connor describe a series of scientific studies that the U.S. National Academy of Sciences commissioned over the past six decades, the BEIR (Biological Effects of Ionizing Radiation) reports. These studies focused mainly on the Japanese atomic bomb survivors, but persons working in nuclear industries, those exposed to medical radiation, and those exposed during the Three Mile Island and Chernobyl events were also studied. The authors examine the LNT (linear no-threshold) mathematical risk model, which has been in use since the 1920s to predict radiation effects. Briefly, the LNT model proposes a dose-response relationship between radiation dose and carcinogenesis in tissues. The implication is that even the tiniest dose of radiation has carcinogenic potential.

In 1946, the Nobel Prize in Physiology or Medicine was awarded to Hermann Muller, who had studied radiation's effects on mutations (structural alteration of genes) in fruit flies. However, even at that time the LNT model's validity was questionable because there appeared to be a threshold below which mutations did not occur; therefore, the underlying premise of the LNT model was compromised. Muller persuaded the BEIR Committee to adopt the LNT model, even in the face of doubts about its validity. The authors describe the inappropriateness of extrapolating the dose response curve from the large dose that Japanese bomb survivors received in one event downward to low doses delivered over time to individuals via medical imaging procedures, and they point out resultant irrational fears and anxieties that are spread in the general public by hyperbolical media publications (Hendee and O'Connor 2012).

In a separate *Radiology* review of the LNT model, Maurice Tubiana and others state that scientific advances in the understanding of radiation biology and carcinogenesis have rendered the LNT model obsolete. They have reviewed studies demonstrating that laboratory markers of DNA damage from ionizing radiation in use today are nonspecific and also that at low doses there are especially strong cellular defenses against the carcinogenic effects of radiation. They have concluded that in humans "there is no evidence of a carcinogenic effect for acute irradiation at doses less than 100 mSv and for protracted irradiation at doses less than 500 mSv." Although the subject remains controversial, they totally reject the LNT model (Tubiana et al. 2009).

The Health Physics Society and the American Association of Physicists in Medicine (AAPM) have promoted a risk/benefit approach to diagnostic imaging. The AAPM discourages making predictions of hypothetical cancer incidence and deaths from low dose radiation by using epidemiological, population-based data derived from large populations that have received a single large dose of radiation. Their opinion is that the "risks of medical imaging at patient doses below 50 mSv for single procedures or 100 mSv for multiple procedures over short time periods are too low to be detectable and may be nonexistent" (Hendee and O'Connor 2012). Additional organizations that share this view include the International Organization of Medical Physicists, the UN Scientific Committee on the Effects of Atomic Radiation, and the International Commission on Radiological Protection (Calabrese and O'Connor 2014).

Even in view of the above, however, there is legitimate concern about keeping radiation doses as low as possible for medical imaging procedures, and this has led to development of enforceable safety guidelines. The potential impacts of ionizing radiation for children are also carefully considered. Organizations representing radiologists in the United States such as the Radiological Society of North America (RSNA) and the American College of Radiology (ACR) promote the responsible use of ionizing radiation in medical imaging procedures, and various state and federal governmental agencies have roles in checking safety and quality assurance.

Superstition and fear concerning radiation can be harmful to individuals, but on a global scale it can be potentially catastrophic.

Superstition and fear concerning radiation can be harmful to individuals, but on a global scale it can be potentially catastrophic. In an excellent historical review titled "Fear of Radiation Is Killing People and Endangering the Planet Too," Theodore Rockwell, a nuclear energy pioneer who had worked on the Manhattan Project and was instrumental in the development of the Navy's nuclear propulsion program, not only focused on potential harmful effects on individuals by avoiding diagnostic imaging studies but also on larger population-based hazards. Rockwell's global perspective of the impacts of irrational fears of radiation, issued in 1998, was prescient. He was discouraged by the fact that coal-fired power plants continued to pollute the air with harmful particulate matter, contributing to tens of thousands of American deaths from respiratory problems when nuclear facilities could have provided clean, safe energy. The contributions of coal-fired plants to global warming, smog, acid rain, and other effluents distressed him. He was also appalled by the number of Americans sickened and killed by contaminated food, which could have been freed of pathogens by food irradiation. Rockwell is also dismissive of the LNT model,

pointing out that we "live in a sea of natural radioactivity" and that the DNA damage that occurs normally as a result of free radicals in metabolic processes, for example, greatly exceeds (by ten million fold!) that from natural radiation (Rockwell 1998).

In 1999, Paul Kurtz, the founder of the Center for Inquiry, published a special report titled "Fears of the Apocalypse: The Escape from Reason." This article focused on fears, superstitions, and hysteria surrounding the coming of the millennial year 2000. He clearly described prevalent forecasts of unprecedented optimism regarding prosperity and technological triumphs, but he also addressed the gloom-and-doom secular and religious millennial prophecies. Regarding the former, he stated: "Overhanging all of this is the sword of Damocles—nuclear energy … . Anything related to radiation was considered diabolical" (Kurtz 1999).

The extreme measures that have been taken in Japan have had economic consequences in addition to contributing to the public's fears and superstitions concerning radiation.

In his book *The Rise of Nuclear Fear*, Spencer Weart describes imagery in the public mind dating back to biblical times of a powerful source of energy with huge beneficial potential on one hand or destructive potential on the other hand (i.e., "hideous death or miraculous life") (Weart 2012).

David Ropeik has contributed a fascinating history of this schizophrenic view of nuclear energy among the American public. He attributes the public's great expectations of radiation's potential at the beginning of the twentieth century to recognition of the progress that had characterized the scientific and industrial revolutions. A story about a small quantity of uranium's potential to "propel a steamship across the ocean" was typical, and most media coverage shaping the public's views was supportive of radiation. Simultaneously, however, a few magical stories erupted concerning some of the dark aspects of radiation. Then Hiroshima and Nagaski shocked the world, instantly ("in a flash") creating an image of the apocalypse, strongly reinforcing the public's fears of radiation. These events actually signaled, or at least paralleled the beginning of public erosion of "faith in science and modern technology." Although later studies revealed that lifetime cancer mortality rate increased less than one percent among the Japanese bomb survivors and that no biological effects appear to have occurred in those individuals who received less than 110 mSv, the fearsome images of the bombs would always be a potent reminder of the destructive potential of the atom (Ropeik 2012).

Multiple challenges to the development of nuclear energy were faced in the years following World War II. Despite President Eisenhower's Atoms for Peace program, an attempt to develop nuclear energy, the environmental movement had concerns about radioactive fallout, and the AEC (Atomic Energy Commission) mishandled public doubts, contributing to the opposition to nuclear power development. Legal barriers were erected too. Ropeik also describes antinuclear rallies led by respected intellectuals such as Albert Einstein and Bertrand Russell who focused on banning nuclear weapons but had the effect of decreasing support for nuclear energy plants. In Ropeik's opinion, the next iconic nuclear event, Three Mile Island, which happened in 1979, was responsible for essentially ending support for nuclear plant development in the United States (Ropeik 2012).

The Fukushima disaster in 2011 represented a confluence of unfortunate circumstances and was a focus of intense, even hysterical, reporting. In "Radiation Superstition," Robert Hargraves referred to a UN scientific committee's findings that none of the workers at the plant who died had been killed by radiation poisoning (Hargraves 2013). Although no deaths or cases of radiation sickness could be documented, more than 100,000 people were evacuated from their homes and there were more than 1,000 deaths associated with the evacuation. Suicide rates were higher than normal. This is tragic since experts have estimated that there were acceptably low levels of radiation in some areas that were evacuated and that overall the expected lifetime exposure that people living near Fukushima received from the event was less than 10 mSv, compared to their 170 mSv expected lifetime dose from natural background radiation (World Nuclear Association 2017).

The extreme measures that have been taken in Japan have had economic consequences in addition to contributing to the public's fears and superstitions concerning radiation. Money has been wasted by preventing its citizens from returning to their homes. In addition, Japan is building dozens of new coal-fired plants to replace nuclear power, and liquefied natural gas is being imported in greater quantities, affecting Japan's balance of trade negatively (Puko 2018).

Ann Stouffer Bisconti has studied factors affecting public attitudes toward nuclear energy, and she considers the following to be critically important: (1) imagery associated with

nuclear energy, (2) accidents, (3) energy needs, (4) proximity of an accident or of a proposed plant, (5) perception of control, (6) political affiliation, and (7) understanding of nuclear energy principles. Many people don't understand the physical principles of nuclear energy and therefore feel intimidated by it. One could make the point that many don't fully understand basic principles of computers or even automobiles either and yet they don't fear them. The obvious difference, of course, is our "hands-on" experiences with computers and cars. They are "up close and personal" to us, and we regard them as generally safe, essential elements of our lives.

Why do radiation fears and superstitions matter in the big picture—the global picture? They matter because they contribute to a global existential threat, climate change.

So where do we stand now regarding nuclear energy? Over the past three decades, public opinion has steadily grown more favorable. According to Bisconti, 49 percent of the public favored nuclear energy in 1983, and in 2016, 65 percent favored it. She found that favorable opinions are based on perception of energy needs, environmental benefits of nuclear radiation, and low cost (once a plant is functioning). Negative opinions were predominantly based on safety concerns (accidents and radiation leaks). In addition, a focus on the renewable energy sources of solar and wind and a drop in gasoline prices have led many to exclude nuclear energy. Although many people expressed their support for nuclear energy, they did not support nuclear plant development in their own communities (Bisconti 2017), the "not in my backyard" philosophy.

Why do radiation fears and superstitions matter in the big picture—the global picture? They matter because they contribute to a global existential threat, climate change. With the advent of alternative sources of energy such as solar, wind, and other new technologies on the horizon, there is some promise that our carbon dioxide levels, the highest in over 800,000 years, can be addressed (PBS.org 2018.) Before this can occur, however, the pernicious narrative of fear and superstition surrounding radiation must be revealed, understood, and disentangled from the realm of pseudoscience. ■

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Multi-Level Menace

Multi-level marketing companies use subtle influence techniques to capture and influence recruits—and you are at risk.

DENISE SUTHERLAND

If you've been around social media lately, you'll have come across a friend who suddenly is posting about makeup, diet shakes, essential oils, shampoo, or even insurance. Their personality seems somehow different. And they want to "catch up for a coffee"—with an agenda.

More and more people are being lured into the glittering promises that are multi-level marketing (MLM) companies. Social media provide rich hunting grounds. MLMs are proliferating. They are aggressive recruiters, with trained workforces using influence techniques to reel in new members. Once signed up, they exploit their members ruthlessly. This isn't an issue we can afford to ignore—we're not safe.

What Is an MLM?

The structure of these companies defines them as multi-level marketing. They also may call themselves network marketing, party plan, or direct sales companies.[1]

Distributors in such companies earn money and advance by selling products or services to end customers but *also* from commissions on the sales of the people who have signed up underneath them, continuing down in multiple levels (hence *multi-level*). The ultimate aim of the people at the top is to earn massive passive incomes off their teams.

All of these MLMs sell some product or service. They each have their own version of "MLM opportunity" where you can sign up as an independent distributor of these things—and of course it costs to sign up.

You sign up under someone—usually a persuasive friend or relative—who becomes your *upline sponsor*. You can then purchase the products or services from the company at varying wholesale discounts and either use them yourself or sell them to others at the retail price.

But the *real* push is to get more people to sign up under you for the "MLM opportunity." You then become *their* upline sponsor. These people are called your *downline*. And when they place a wholesale order with the company, *you* earn a commission based on the amount *they* spend. And when they sign up people underneath them, you might earn commissions on *those* people's orders as well. This is how the big bucks are made at the top of MLMs—from downline commissions, not product sales. Studies show that only 1 percent of people at the top of an MLM typically make a very large income. The 99 percent remaining make minimal income, nothing, or lose money (Taylor 2011).

MLMs love to tell their new members that they are now "small business owners"—I'm sure you've seen the #girlboss, #bossbabe, and #mompreneur tags on Twitter, Facebook, and Instagram. But legally, recruits are "independent distributors" and operate within very strict rules imposed by the company (MLM Intel 2018). They are not running their own business. They cannot sell the products however they wish. They are victims.

Who *Are* These Companies?

There are hundreds of MLMs—some are mainstream to the point of seeming "harmless," such as Avon and Tupperware. Others are becoming more visible, such as dōTERRA, LuLaRoe, Isagenix, Younique, and Primerica. Some "brick and mortar" businesses, such as The Body Shop and Swarovski, have MLM arms.

These MLMs operate in a legal gray area. Are they legitimate business opportunities? Are they pyramid schemes? These are questions that keep lawyers and regulators arguing and are beyond the scope of this article. MLMs often claim they're not pyramid schemes because they sell products or services—but product-based pyramid schemes *are* a thing.

Some warning signs are:

- recruiting participants is unlimited, in an endless chain;
- advancement through the hierarchy is based on recruitment achievements;
- ongoing purchases from the company are required to advance and/or earn commissions;
- the company pays commissions to more than five levels of distributors;
- more profit is earned from commissions than from the sale of the actual product[2]; and
- the use of complex points systems instead of accounting

with actual money.

Basically, these companies have a few people at the very top exploiting a massive number of people below them. They can cause real harm to their members financially, socially, and emotionally.

Cult specialist and counselor Steve Hassan defines "any group that uses unethical mind control to pursue its ends—whether religious, political, or commercial—as a destructive cult" (Hassan 2016, 39). On this basis, my view tallies with his—MLMs are cults.

But, whatever their classification, these companies use undue influence methods to catch and (attempt to) keep their recruits.

Who Are the Victims?

Some MLMs prey on college students—great way to cover your tuition fees, right? Military wives are targeted—they often have to make new friends when moving. Chronically ill people are also targets—make an income when you're too unwell to have a regular job. Young mothers at home are *especially* targeted, playing on their desire to be with their children and contribute to the household income. But all of us can fall victim to these companies. Don't be complacent.

Ex-members are often too damaged or embarrassed by their experiences to speak out—or too scared—so their stories remain unheard and the public remains unaware.

Because cults are not well understood, it makes us all easy prey. Our biggest weakness is not grasping how these groups operate. One of the ways that we are vulnerable is we are sure that we're *not* vulnerable. We like to think that those "brainwashing tricks" wouldn't work on *us* and that only "stupid, weak people" join MLMs and cults.

We believe that we are in control of our own minds and no group could unduly influence us without our assent. However, our brains are changing all the time, even if we don't like to acknowledge it. Our unconscious minds can get overloaded and make bad decisions. Just think of how well you operate and make decisions after a week of insomnia. Listening to droning, repetitive speeches when drowsy is dangerous—the critical mind is not paying attention, and "undue influence" can slip in under your usual radar.

Who is more at risk? It's true that some people are more vulnerable to cult influence than others because of their personalities (not their level of intelligence). As neuroscientist Kathleen Taylor explains, creative people who are open to new ideas, think intuitively and flexibly, and are tolerant of "outgroups" seem to have increased suggestibility and susceptibility to influence attempts. People pleasers and people who aren't great at critical thinking are also more vulnerable (Taylor 2017, 214–215).

Certain stresses make you more susceptible to influence, too, breaking down your usual defenses. MLMs rely on the effects of stress on your brain. A death in the family, loss of a job, a relationship breakup, a serious illness, and so on—at these times, you're especially vulnerable to approaches from a friend offering you a way out, some "sure-fire" income, a sympathetic ear.

Studies show that only 1 percent of people at the top of an MLM typically make a very large income. The 99 percent remaining make minimal income, nothing, or lose money.

MLM approaches can appear from many quarters. It might be a friend or family member who is already in an MLM. You might find yourself at an MLM-sponsored event or caught up at an MLM booth at a craft fair. Increasingly Facebook, Instagram, Twitter, YouTube, websites, and blogs are awash with MLMs.

Trained recruiters. MLM members are *trained* on how to get new recruits and "build their downline." Often the members being coached don't realize that *they're* being manipulated into manipulating others! They are taught tactics such as always be smiling and positive. Don't say anything negative. Make plenty of time to connect with your prospect. Become good friends with them.

Members are taught to tailor their message to their prospect. Are you interested in earning lots of money? They will talk about the huge earning potential. Do you want to stay home with your kids? They will focus on how flexible your work hours can be.

They have script books on how to respond to common objections. If you say: "I already have a full-time job," their response will be something like: "Brilliant! You've got heaps of contacts for booking parties and finding your first downline at work. A lot of women sell [MLM product] part-time for extra income."

This quote is from a book on network marketing, explaining how to deal with a prospect who says no because they have no interest:

> Thank them for their time! Add them to your newsletter list and Facebook for monthly follow-ups so they become a part of your "audience", watching what you do over time. Again, ask for referrals. If you replace every "no" with a referral, your contact list will never run dry! Follow-up with them from time to time, letting them know what's new and exciting in your company and to see if the time is right to revisit. The fortune is in the follow-up! (Robbins 2013, 74)

They don't take no for an answer—it's only "no for now." These people are trained, prepared, and insistent. You need to be aware that they *are* influencing you.

MLMs love to tell their new members that they are now "small business owners" but they are not running their own business. They cannot sell the products however they wish. They are victims.

The Impact of Influence

> Sometimes, when we are sufficiently motivated, we stop and think about the influences we experience. When we do not we are open to exploitation. (Taylor 2017, 76)

Our world is constantly influencing us.[3] Whether it's a counselor helping us to overcome anxiety, a company wanting us to buy their cereal, a political party wanting us to vote for them, or a deceptive group trying to get you to join, influence is everywhere. Many forms of influence are benign or helpful, such as education and psychotherapy. But there are darker motives around.

We have ways of automatically responding to certain situations (for example when someone gives us an unexpected gift) with automatic responses (we feel an extremely pressing need to reciprocate). There are many such innate responses that we're not consciously aware of. Automatic responses are critical for our survival—we can't pay close attention to absolutely everything around us constantly, so they're not a bad thing. But they can be misused.

MLMs use these influence methods regularly. For example, people react strongly to scarcity, which causes a drive to get whatever is rare. An MLM only needs to say a popular item is out of stock (which may not be the case). Their distributors get stressed about the "out of stock situation." Then suddenly there's more stock available but only in "limited quantities."

This announcement triggers panic buying by the distributors, who often order more than they actually need—or can sell—of the "scarce" product. The company gets a burst of orders, makes a heap of money, and the hapless distributors end up with too much of that product, probably have trouble on-selling to their customers, and end up with piles of the stuff in closets, not to mention mounting debt.

How MLMs Operate

Recruitment and losses. People generally don't join cults; cults actively *recruit* them. MLMs especially always need fresh blood. The drop-out rate from the "base of the pyramid" is massive—estimates put it at 50–90 percent per year (FitzPatrick 2017). To maintain the level of passive income the top 1 percent enjoy, they need to constantly replace these membership losses. They pressure their downlines to continue signing up new members. MLM training and conferences focus heavily on training their members in how to recruit—how to overcome objections, how to overcome shyness, how to build a team, and so on. Many people make a career out of training MLM members how to recruit and build teams. Most books on network marketing, direct sales, and MLMs are about recruiting and team building.

Mind control. Mind control is also called "thought control, brainwashing, and undue influence." It is the process of controlling people through intentionally and deviously changing their normal beliefs and thought processes. It's not forced indoctrination, as seen in military settings, but persuasion through subtle influence techniques. Someone who has successfully been subjected to undue influence typically isn't aware of it. They will tell you that they're thinking clearly and freely for themselves.

There are several mind control models out there. The one I'm describing here is cult specialist and counselor Steve Hassan's BITE model. BITE stands for Behavior, Information, Thought, and Emotions. MLMs somewhat affect these things with prospects but more so with recruits once they've signed up.

Behavior Control. This is control of a person's environment—their clothing, diet, rituals, sleep, and activities. While not as extreme as some religious cults, MLMs do work to control their recruits by setting specific achievement goals (monthly tasks, team targets, etc). Most have a dress code, maybe a particular shade of blue is required to be worn at all company training and events. Some require their female members to wear skirts with pantyhose, not trousers. "Running your business from your smart phone" means that there is great restriction of free time—and in fact, recruits are generally glued to their phones, posting on social media, messaging prospects and customers, and neglecting their families.

Information Control. It is easy to be controlled if you don't have accurate information. MLMs are often caught lying or withholding or distorting information. The super keen members don't read much except for MLM-related material. And the material these companies put out can be really dodgy, especially if they're making health or science claims, as many do.[4] Members are not allowed to criticize the leaders, products, or organization—not even in their private Facebook distributor groups. They are specifically told not to share any

doubts or criticisms with their downlines.

Distributors are encouraged to report each other's misdemeanors (such as disclosing income or selling products on eBay) against the company's official policies to their MLM's Compliance Department. This encourages spying on each other and creates an atmosphere of fear.

Thought Control. These groups have internalized doctrine and language. They advocate thought-stopping practices. They block out information critical of the group and disbelieve criticisms. *The Secret* and Law of Attraction materials are promoted within MLMs. Members are also often told to avoid contact with ex-members and critics—those "haters" and "negative Nancies" who are just "bitter because they didn't try hard enough and failed." Questioning or critical comments are usually treated with "delete and block." When presented with facts about MLMs, they cannot hear it. "Because of thought control, factual information that challenges the cult worldview does not register properly" (Hassan 2016, 121).

Distributors are encouraged to report each other's misdemeanors, which encourages spying on each other and creates an atmosphere of fear.

Emotion Control. Deceptive groups can take advantage of identity guilt. Young moms at home who feel guilty that they're not contributing to the family income are an easy target for MLMs. Love bombing is used to influence and entice recruits, and the level of emotional control ramps up once you sign up. Happiness is redefined as having lots of recruits and money. If things go badly, members blame themselves rather than the company, business structure, or leaders.

Any criticisms of the products, revered founder, or the company are quickly quashed. Negative comments are deleted, angry or upset distributors are silenced, and "mean girl" behavior abounds.

The distributors are desperately trying to fit in with their new group of "MLM friends," doing what they're told. They're sold the lie that if they do *this* or *that* they will succeed and earn heaps of money, the car, the "free" vacations.

Anti-MLM campaigner Bot Watch sums it up nicely:

> The recruiters act as though they really care about you. They might call you and other people in their teams "hun" and litter their social media with heart emojis and positive, uplifting messages aimed at raising your confidence and feeling part of a new "family"… [However] MLM people advocate unfriending and cutting out people from their lives if they question the new MLM family. A Them vs Us feeling is created. For each real-life person cut off, the MLM bond is strengthened. (BotWatch 2017)

In a Nutshell

What it boils down to is this: we're *all* at risk. Just being smart isn't enough protection. MLMs are everywhere, infiltrating your social groups and communities, both online and off. New MLMs are popping up all the time. It's crucial to learn about how these deceptive groups ensnare and exploit people. Know the names of these companies. Be suspicious of vague "business opportunities." Educate yourself about cults and influence. Research online thoroughly before you join a group, attend a "life-changing lecture," or sign up for "your own business." Caution your loved ones who are considering signing up.

Stop and think. This is the way to resist persuasion. Be careful out there. ■

If You Need Help

If you have a loved one who is embroiled in an MLM and you're concerned, I highly recommend reading Steve Hassan's very practical book *Freedom of Mind: Helping Loved Ones Leave Controlling People, Cults, and Beliefs*. For more information and support, visit the Anti-MLM Coalition's website mlmtruth.org, which has many articles and provides links to other MLM resources, covering a wide range of companies.

Notes

1. Some direct sales companies are benign, as they focus on sales, without recruitment—but some recruitment MLMs call themselves direct sales companies, muddying the already muddy waters.
2. Summarized from *The 5 Red Flags: Five Causal and Defining Characteristics of Product-Based Pyramid Schemes, or Recruiting MLMs* (2006) by Jon M. Taylor, www.ftc.gov/system/files/documents/public_comments/2006/07/522418-12585.pdf.
3. The primary ways people are influenced are: reciprocation, commitment and consistency, social proof, liking and making friends, authority, scarcity, and instant influence. To learn more about influence, read Cialdini's seminal book *Influence: Science and Practice*.
4. See "Crimes against Science," *BotWatch Blog*, February 17, 2018, botwatch.blog/2018/02/17/crimes-against-science/.

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I've Got Algorithm. Who Could Ask for Anything More?

The news has been filled with discussions of the so-called algorithms of Facebook and other software giants. Originally, the word *algorithm* had a precise meaning, but more recently it has been used to elicit undeserved respect—and perhaps to avoid deeper scrutiny.

PETER KASSAN

Not too long ago, the word *algorithm* was pretty obscure. According to a Google search, its occurrence (in books, at least) was essentially nil until around World War II (the very beginning of the computer era), when it started to creep up.[1] A recent Google search for the word returned nearly 150 million hits;[2] a search for news stories containing the word returned well over 500,000 hits;[3] and Amazon offered over 30,000 books with the word in their titles.[4]

Some of these books suggest that all we need—rather than love—is algorithms, such as *The Master Algorithm: How the Quest for the Ultimate Learning Machine Will Remake Our World* (Domingos 2015), *The Advent of the Algorithm: The Idea that Rules the World* (Berlinski 2000), and *Algorithms to Live By: The Computer Science of Human Decisions* (Christian and Griffiths 2016). Some of these books suggest that the combination of algorithms and big data[5] means that science itself—the entire enterprise of investigation and discovery—is obsolete.

It sounds like algorithms are pretty important. So what, exactly, is an algorithm?

As originally used in the early nineteenth century, *algorithm* (which derives from the same root as the word *algebra*) meant a sequence of operations *guaranteed* to eventually produce the answer to a particular problem. Of course, computers hadn't been invented yet, so the operations were performed by people, and the problems were all in *pure mathematics*.[6] The classical idea of *algorithm* embodies a few simple notions:

- It's a set of rules.
- The rules specify a sequence of steps that can be performed mechanically, without any judgment.
- The sequence of rules eventually produces a result—or stops without producing one. In other words, it never just goes on and on forever.
- If it finds one, the result is *provably* correct.

Examples of early classical algorithms include Euclid's Algorithm, which finds the greatest common divisor of two whole numbers; The Sieve of Eratosthenes, which finds prime numbers; and Binary Search, which finds an item in a sorted list. More prosaic examples are the procedures[7] you learned in elementary school to do arithmetic—the ways you do addition, subtraction, multiplication, and division (if you still do them yourself) are all algorithms.

Implicit in the original notion of algorithm is perfect knowledge—that the numbers on which the algorithm is to operate are known. For example, in the Traveling Sales Professional Problem,[8] it's assumed that the map is fixed and certain—that roads won't be closed, that new roads won't open, that traffic conditions can be ignored, and so on.

Algorithm used to be contrasted to *heuristic*. A heuristic

is just like an algorithm except that its result can't be proved correct—and probably isn't. Implicit in the idea of a heuristic is that it's good enough for practical purposes, a rule of thumb. A good heuristic produces a result that's *likely* to be *close* to the best *most of the time*.

It's more than curious that *algorithms* are all the rage while *heuristics* are the forgotten sibling—the same Google News search that produces over half a million results for *algorithm* yields only a little more than ten thousand for *heuristic*. (*Algorithm* certainly *sounds* fifty times better than *heuristic*!) But none of the algorithms lately in the news actually *are*—at best, they're heuristics, but even saying that is giving them too much credit. Because even *heuristic* applies to a procedure whose results can be evaluated objectively.

Many of the supposed algorithms are embodied in so-called recommendation engines—see *You May Also Like: Taste in an Age of Endless Choice* (Vanderbilt 2016)—from Amazon, Yelp, Netflix, Pandora, and so on. Although there's now even a computer science discipline called "recommendation theory," recommendations can only be evaluated subjectively—a far cry from the original notion of algorithm—or even heuristic. Whether a program has correctly calculated the optimal route for a spaceflight to Mars isn't a matter of opinion or survey.

Whether algorithm or heuristic, there's supposed to be a coherent set of rules that can presumably be reviewed and understood by a human being. Neither algorithm nor heuristic is supposed to be an oracle that makes announcements to be uncomprehendingly accepted and obeyed. For the newsworthy algorithms (the ones that are going to save the world), this is pure fiction. No one can really say specifically what the rules are or specifically what they're supposed to do, only that they're supposed to do a good job.

Why, then, is the word *algorithm* used at all, rather than the more familiar (and less pretentious) phrase *computer program*? After all, all supposed algorithms are implemented in computer programs—no one is talking about performing them by hand. And therein lies the intended distinction: The computer program merely implements the algorithm. The algorithm itself is the idea underlying it. This, in turn, implies that there's an actual idea behind the program, rather than the usual kludge behind more pedestrian programs.

In some cases, this may actually be true—or, at least, may once have been true. For example, the original idea behind Google webpage ranking was borrowed from the way in which academic papers have been comparatively evaluated.[9] A useful way to do so is simply to count how many citations a paper receives—the more often a paper is cited by other papers in reputable journals, the more likely it's worthy of attention. This idea can be applied recursively, so that each citation can in turn be weighted by how many times that paper is itself cited, and so on. Applied to pages on the internet, each page can be given a score based on how many other pages hyperlink to it. And, analogously, the value of each page hyperlinking to a page can itself be measured in the same way.

Unfortunately, once this was understood and implemented, it could be played. So-called link farms were created for the sole purpose of containing hundreds or thousands of hyperlinks to a particular webpage to boost its ranking on Google and the other search engines. This, in turn, led to an arms race between the search engines and the practitioners of the dark arts of search engine optimization (SEO). Whatever integrity and intelligibility the Google page rank algorithm once had, opacity became an asset rather than a liability—a feature, not a bug.[10]

It sounds like algorithms are pretty important. So what, exactly, is an algorithm?

Google is said to modify one aspect or other of its search engine algorithm hundreds of times a year.[11] This is actually a very old technique called trial and error. You don't like the way unscrupulous SEO magicians are gaming you to get their clients higher in your results? Make a change somewhere and try it out. Like the results? Great! No? Try something else. Six months later, when the SEO wizards have figured out a new trick to boost their clients' rankings, try another change.

Except for companies and websites whose revenues rise and fall according to their ranking in search results, changes to the Google algorithms probably aren't all that consequential. But some algorithms—applied in much more consequential situations such as hiring, loan-making, housing, juror selection, and medical diagnosis—have less trivial results (see *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy* [O'Neil 2016]). The worldwide stock market crash of 1987 known as Black Monday is be-

lieved to have been caused—at least in part—by algorithmic trading. Since then, markets are not infrequently hit by what have come to be known as a *flash crash*. For example, a recent headline reads "Oil went through a flash crash overnight, putting an already fragile market on edge." Tellingly, "Traders blamed forced margin calls and computer trading for the so-called flash crash but were not quite sure what caused the drop." That's right: *No one knows exactly what these algorithms are supposed to do or what they're actually doing.*

In many cases, what we ask an algorithm to do is effectively impossible. For example, the occurrence of terrorism is so rare (fewer than one person in a million commit an act of terrorism in the United States per year[12]) that there are no reliable indicators. Even if a statistically reliable pattern could be found, any algorithm would find overwhelmingly more false positives than true ones. For example, suppose a terrorism identification algorithm was 99.99 percent accurate—that is, it misidentified an innocent person as a terrorist only 0.01 percent of the time. Applied to the general population of the United States of about 330,000,000, it would identify some 33,000 people as terrorists. If only ten of those people actually were terrorists, such an algorithm would actually still be wrong some 99.97 percent of the time!

The more data you give the algorithm to analyze, the more it will find random, spurious correlations. And if you haven't identified and gathered the metric that's actually causal, no amount of data will help.

The sort of algorithm meant to find terrorists is of a type known as pattern-recognition or pattern-matching. The idea is that you show a lot of examples of what you're looking for (and *not* looking for) to a deep learning program. It finds patterns that it then applies to new cases by seeking correlations between input and output. What could possibly go wrong?

Paradoxically, having a lot of data to learn from ("big data") makes things worse rather than better. The more data you give the algorithm to analyze, the more it will find random, spurious correlations. And if you haven't identified and gathered the metric that's actually causal, no amount of data will help. (This is why the notion that algorithms obviate science itself is so misguided—science involves much more than finding correlations in existing data. The fundamental goal of science is to find *causal* relationships—and this often involves inventing new instruments, tools, and materials to make new observations and measurements guided by new insights and new ideas.)

In many cases, what we expect the algorithm to do is completely unreasonable. For example, after some people used Facebook's recently introduced Live facility to stream videos of horrendous crimes as they were being committed, Facebook apparently thought they could devise an algorithm that could scan all the streaming videos and automatically determine in real time what was being shown. Presumably, this would include being able to distinguish between, for example, an actual murder and a high school play depicting one.[13] It should come as a surprise to no one (except, perhaps, Mark Zuckerberg) that this effort wasn't successful. Facebook has given up on this and has hired 3,000 people—actual human beings!—to screen the live feeds and use their judgment.

If not videos, what about still images? Google's image search facility is extremely impressive—type in anything you can think of, and hundreds or thousands of photographs and other graphics—most but not all of them appropriate—are immediately returned. Does Google actually have an algorithm that can scan every photograph and every graphic on the web and figure out what's in it?

Well, no. Google's image search algorithm relies on two methods:

• Almost all of the photographs and other images on the web have file names and other associated text.

• People are paid a few pennies a picture to look at them and add tags (through facilities such as Amazon's Mechanical Turk).

In other words, *image* search is actually just *text* search that returns images. When you perform an image search by pointing to or uploading an actual photograph, Google looks for a file containing identical (or overlapping) data.

Only when it finds such a match can it figure out what the photograph actually depicts by looking at the associated text. This is all very useful and convenient and impressive, but there's no wizard (or algorithm) behind the curtain. (When it doesn't find one, Google makes an extremely generic guess. For example, upload a photograph of a wooden loom, and Google guesses that it's a piece of furniture.)

Before the advent of the internet and the ever-changing world wide web, it was usually demanded that a new computer program be comprehensively (if not exhaustively) tested. In some cases, it still is. For example, if you've ever made a mistake filling out an online form, you know that your input is checked against its expected format—for example, a phone number consists of ten digits. Before that form went live, the quality assurance department undoubtedly tested every field to see if it properly rejected bad input and properly processed good input. A crucial metric of the quality of a testing effort is *coverage*—the proportion of test cases to all possible inputs (or types of input), usually expressed as a percentage. (Where possible, testing is automated—for every test case, the input and the corresponding output are specified.)

But, in many cases, this kind of comprehensive testing isn't even conceivable. For example, the input to early artificial neural nets (a kind of pattern recognition algorithm) typically consisted of a binary grid of 8 by 8 cells—in other words, a chessboard in which each square could be filled (1) or empty (0). Even an array as simple as that has 18,446,744,073,709,551,616 different possible inputs.[14] Such artificial neural nets were typically programmed with a few hundred training cases and then tested with a few hundred more before being set to work picking stocks or race horses. Even with a thousand training cases and another thousand test cases, the coverage is on the order of 0.0000000000000001 percent.

These days, saying you've got an algorithm is saying almost nothing at all.

Modern image processing programs handle files that are astronomically larger. A modern digital camera takes photographs with millions of pixels, each of which can take a million or more possible values. The number of possible inputs is considerably larger than the number of quantum particles in the universe. Your image processing program will work amazingly well almost all the time—but one day may suddenly undergo the equivalent of a flash crash.

These days, saying you've got an algorithm is saying almost nothing at all. Applied outside the narrow field of abstract problems of pure mathematics, the word *algorithm* implies a purity, an integrity, a correctness that's simply unattainable in the real world. ■

Notes

1. https://books.google.com/ngrams
2. https://www.google.com/?gws_rd=ssl#q=algorithm
3. https://www.google.com/webhp?hl=en&gl=us&tbm=nws#hl=en&gl=us&tbm=nws&q=algorithm
4. https://www.amazon.com/s/ref=nb_sb_noss_2?url=search-alias%3Dstripbooks&field-keywords=algorithm. Most of these are technical.
5. Another term that has recently become ubiquitous.
6. Pure mathematics is the study of numbers in the abstract—without any consideration for what they might count or measure in the real world. Of course, many of these problems were abstracted from real problems in the real world, but they were studied without any reference to those real-world problems that inspired them.
7. Another term for algorithm is *effective procedure*.
8. Originally, the Traveling Salesman Problem. It's the problem to find the best (shortest, fastest, cheapest) route visiting all the cities on a map connected by a defined set of roads between them—for any map with any set of cities and any configuration of roads. Finding the best route between any two cities is an equivalent problem. (Of course, in the mathematical version of the problem, all of these things—cities, roads, speeds, distances, costs—are abstracted.) Google Maps and other routing apps almost always do well enough, but they can't be guaranteed to yield perfect results.
9. See http://ilpubs.stanford.edu:8090/422/1/1999-66.pdf.
10. The totality of Google software is said to be about two billion lines of code (see https://www.wired.com/2015/09/google-2-billion-lines-codeand-one-place/). That's well beyond the ability of anyone to read and understand.
11. http://www.mainstreethost.com/blog/google-algorithm-updates/
12. In 2015, nine people were involved with terrorist acts in the United States.
13. This wouldn't necessarily be equivalent to achieving full and complete human-level artificial intelligence—but it would come close.
14. This recalls the fable of the mathematician who bested the emperor who asked how he would like to be repaid for a minor service. The mathematician asked for a single grain of rice for the first square on a chessboard, two grains for the second square, four grains for the third square, and so on. The emperor readily agreed, only to learn that the payment would bankrupt the kingdom.

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Biological Reasons Young-Earth Creationists' Worldwide Flood Never Happened

Like the geological evidence, biological evidence demonstrates that a worldwide flood never happened 4,350 years ago, as young-Earth creationists believe.

LORENCE G. COLLINS

Christians who call themselves creationists believe that a creator formed the universe, Earth, and its life, but beliefs about creation and evolution exist along a considerable spectrum.[1] Among the landscape of modern evangelical Christianity, many contemporary young-Earth creationists (YECs) have a narrow view of what constitutes "biblical" creationism.

Using well-established biological concepts and observations of living animals as well as in fossils of both plants and animals in the geologic column of sedimentary rocks, I will address concerns with this narrow view. I demonstrate that this view is misguided, that a worldwide Noah's flood never happened about 4,350 years ago, and that Earth is much older than 6,000 years. This approach complements my earlier Skeptical Inquirer article, "Twenty-One Reasons Noah's Worldwide Flood Never Happened" (March/April 2018), which focused on geological evidence.

Most young-Earth creationists believe that the sediments deposited by this flood were deposited over Earth's globe and constitute a large portion of the geologic record beginning in the Cambrian Period in the Paleozoic Era to at least the end of the Cretaceous Period in the Mesozoic Era. They believe that all sedimentary rocks younger than this time from the Paleocene to the present (Holocene at the top of the time scale) were deposited after the flood (Hill et al. 2016). In the time scale shown in Figure 1, 6,000 years would hardly be the thickness of a sharp pencil line at the very top of the image. Therefore, the YECs condense the extent of animal and plant generations to an extremely tiny fraction of the length of this image. As I demonstrate, such a belief requires abandoning large portions of scientific consensus and common sense, but a recent Gallup poll[2] of the adult population in the United States indicates that nearly half of the people in this country (46 percent) believe what young-Earth creationists claim is the literal biblical time frame. (A more recent Gallup poll[3] indicates that 38 percent of the adult population believes that humans were created by God in their present form but that a very young age for the origin of Earth is roughly 10,000 years.) However, in this article it is assumed that the very long ages indicated in Figure 1 are valid.

Much has been written about geological failings of so-called flood geology (Hill et al. 2016). Here I will focus instead on some observations of organic life and how their characteristics, ecology, and distribution raise far from trivial problems for the YEC understanding of a global flood.

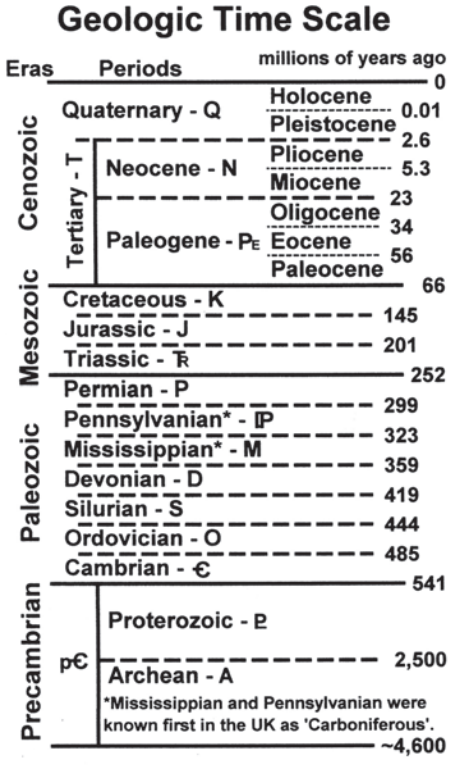


Figure 1.

Animals on Noah's Ark

Regarding the origins and maintenance of biological diversity, young-Earth creationists also believe that the animals that are seen today were brought to Noah's ark in pairs (or in septets for clean animals, per Genesis 7:2–3) and the pairs eventually evolved to form different species. That is, not all of today's species (more than five million and perhaps as many as fifty million) were placed on the ark but only representatives of kinds or baramins.[4] (A *baramin* is a badly coined word combining the Hebrew words *bara* [created] and *min* [kind]; *minbaru* is closer to the Hebrew.) Baramins (when referring to animals) are approximately equivalent to the taxonomic category of families of animals. For example, a pair of cats in the cat family was put on the ark from which lions, tigers, cheetahs, leopards, pumas, caracals, jaguarondis, servals, ocelots,[5] and other species of cats evolved to make the thirty to forty known cat species in the world today, including domesticated cats. In the same way, a pair of canines, a pair of horses, and pairs of other kinds of animals were also brought onto the ark, and each pair produced the different species of each kind, or baramin, that are observed today. The effect of this is that the number of animals that Noah had to preserve on the ark is minimized, presumably allowing enough space to care for and feed them.

Conventional geology and paleontology recognizes that there are as many as fifty million Linnean species living today,[6] including thirty million modern insect species for which 73,000 have been described.[7] Furthermore, it also must be recognized that much greater numbers of animal species once lived on ancient Earth. According to YECs, these were supposedly buried in sedimentary rocks deposited by Noah's Flood. So what is seen today is only a tiny part of the vast majority of life that once lived on Earth. Within the context of an ancient Earth and our understanding of the geologic column, the number of buried and extinct species in the fossil record could perhaps have been more than five billion different species or organisms.

Cetaceans and Sea Reptiles—Numerical Relationships

To illustrate the vastness of the fossil record, consider the cetaceans and the extinct sea reptiles. There are eighty-eight living species of cetaceans, which include whales, dolphins, porpoises, and other related species. Some of the more than 150 extinct species of cetaceans in the fossil record are as old as the Eocene Epoch. Therefore, these are found only in the very top of the fossil record.[8] But note that before the Paleocene, just sixty-six million years ago, not a single whale fossil has been identified in the fossil record. Instead, what is observed in the fossil record is a diversity of sea reptile fossils. The Triassic, Jurassic, and Cretaceous Periods of the Mesozoic Era are known as the Age of the Dinosaurs, but these periods also should be known as the Age of Sea Reptiles. (See geologic time scale, Figure 1.) All these sea reptiles filled the same ecological niches that the cetaceans now fill—deep water, mid-level water, and shallow water. Some had the same shapes as whales, dolphins, and porpoises, except that they had sharp teeth, whereas most cetaceans lacked teeth. There are more than 500 different species of sea reptiles currently recognized in the fossil record.

If it were true that Earth is 6,000 years old, as the YECs claim, and if every kind of animal were created during the Genesis Week (including whales, "the great sea monsters," as reported in Genesis 1:21), wouldn't it be remarkable that somehow all sea-living cetaceans survived the flood but not a single sea reptile did? Even then, only a particular set of eighty-eight cetaceans survived that are living today. Of the 550 extinct sea reptiles, there are 200 species of ichthyosaurs, 250 species of plesiosaurs, and 100 species of mosasaurs. One species of mosasaur was sixty feet long. The mosasaurs lived only in the Cretaceous Period, so not all extinct sea reptiles lived at the same time. Other sea reptiles appeared at different times in the Mesozoic Era and then became extinct. Moreover, not all cetaceans lived at the same time, and some became extinct at different times. This distribution of fossils begs for an explanation.

Observations of organic life and their characteristics, ecology, and distribution raise far from trivial problems for the YEC understanding of a global flood.

It should be apparent why the young-Earth creationists have been unable to explain why no one has ever found a whale fossil bone in Noah's Flood deposits, as explained above, when whales must have been living during Noah's Flood, having been created well before Noah. How could Noah's Flood separate out free-swimming cetaceans from free-swimming sea reptiles, so that the cetaceans still remained alive after the flood whereas the sea reptiles became extinct and preserved as fossils, particularly when both animal groups had to be living at the same time? Moreover, if they both were living at the same time, how would these creatures have been able to compete in the same environments for food? Both groups appear to be adapted to similar environments. Within the context of an ancient Earth, these patterns are easy to explain. Sea reptiles lived and died well before mammals adapted to living in the sea and became the many species of cetaceans that are alive today. These two groups never lived together and, therefore, never competed for the same resources.

Bird Species

There are 9,000 to 10,000 species of birds on Earth today, of which there are 1,500 species of passerines. Passerines are

birds that have feet adapted for perching, such as songbirds. Examples are sparrows, cardinals, gold finches, tanagers, snow buntings, finches, warblers, and blue birds. But perhaps 10,000 extinct species of birds have been found in sedimentary rocks, most of which were supposedly deposited after Noah's Flood, 4,350 years ago. Jean Lightner[9] suggested that there were 196 pairs of bird kinds on the ark, including ducks, owls, hawks, shore birds, woodpeckers, etc., that supposedly evolved to produce the 10,000 species of living bird types today. To produce 10,000 species of birds from 196 pairs of birds in just 4,350 years is amazing in itself, but even more incredible, these initial birds also must have given rise to an additional 10,000 species of extinct birds in less than 4,350 years because their fossils are found in what most YECs believe are post-flood rock deposits. This great number of birds would require super-speed or ultra-fast evolution that modern studies of rates of genetic changes in the DNA code do not support.

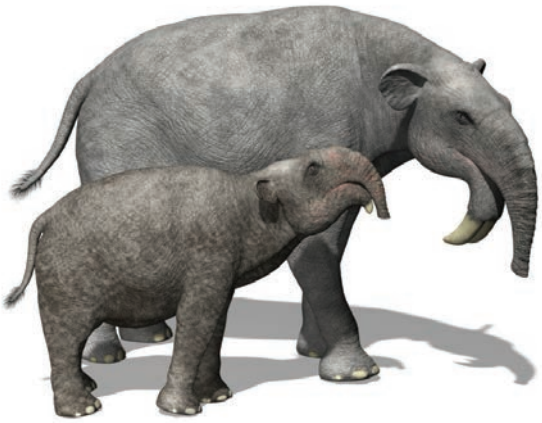


Figure 2. *Deinotherium*

To produce 10,000 species of birds from 196 pairs of birds in just 4,350 years is amazing in itself, but even more incredible, these initial birds also must have given rise to an additional 10,000 species of extinct birds in less than 4,350 years because their fossils are found in what most YECs believe are post-flood rock deposits.

Elephant Species

Five species of elephants have lived in the modern or near-modern era (three different elephant species, mastodons, and woolly mammoths). But there are more than 150 species of elephants, more broadly known as the proboscideans, that are extinct, including the mastodons and woolly mammoths. Presumably, an ancestral pair to all these elephant species was brought onto the ark. One of these extinct elephants was *Deinotherium* (see Figure 2), which was a much larger animal than the modern elephant.[10] It had downward projecting tusks instead of curved upward-sweeping tusks. Some elephant species had four tusks.

Thousands and thousands of fossils of *Deinotherium* elephants have been found in a hundred different locations—Africa, Asia, and even Jordan, Arabia, and Mesopotamia (Iraq) where Hebrew tribes once lived before and after the supposed Noah's Flood.[11] Thousands and thousands of fossils of each of the other 150-plus species of elephants have also been found. Therefore, millions of individuals of these many different elephant species must have lived at one time because only a few of these animals could be expected to be preserved as fossils.

A point that young-Earth creationists must consider is that if *Deinotherium* were living before and after the flood, why did people living in either time not draw any pictures of them or describe them in the Bible, particularly because *Deinotheria* are found as abundant fossils in the areas where early Hebrew tribes were living? However, a Google search for cave images of mammoths shows that many such images are found. Moreover, if all these elephant kinds evolved from just a pair of a generic elephant kind, then evolution would have been at a super-speed or ultra-fast to create over 100 species of elephants, including the mammoth.

As many as ten million mammoth fossils are believed to be preserved in the permafrost in the tundra in Siberia, including a complete frozen carcass of a young mammoth with buttercups still found in its stomach.[12] Why are so many mammoth fossils found? These animals must have been living, perhaps near the end of the Ice Age, when a tongue of ice from a glacier flowed across a valley to block the flow of water in the valley. The ice dam created by this blockage then caused a large lake to backup in the valley behind the dam, and the water in the lake must have increased in depth as water continued to flow down the valley from higher elevations. Eventually, the level of the water rose behind the ice dam sufficiently to cause the ice to float. When that happened, suddenly the water, with great depth and under high pressure, rushed out underneath the ice to cause a huge flood, called a *jökulhlaup* (an Icelandic term), which is a high wall of water that rushes down the valley. If a large herd of mammoths were grazing in a flood plain down-valley, they could suddenly be overwhelmed by this flood and become buried and eventually frozen in the flood debris. Many such *jökulhlaups* could have happened repeatedly through hundreds of years, so that many herds of mastodons could have been buried to produce the millions of mammoth fossils. Therefore,

because millions of fossils of mammoths have been found in Siberia, there also must have been super-speed growth-rates for all these mammoths to be reproduced in less than 4,350 years.

Consider also the rate of population growth of large herbivores. It is generally known today how fast elephants reproduce to create offspring—it takes many years. Some do not begin to reproduce until they are twenty years old and then only have offspring every five to six years.[13] Therefore, to produce several huge herds of millions of mammoths that YECs require in a short time frame would require idealistic population growth including no death before bearing young, maximum birth rates, and always being able to find a mate to name a few. Thus, more time would have been required than creationists allow for in their chronology of Earth. Moreover, there must have been other large herds of mammoths that were not caught in sudden floods and buried. Therefore, it is even more evident that such a growth-rate cannot occur to produce this many mammoths in less than 4,350 years.

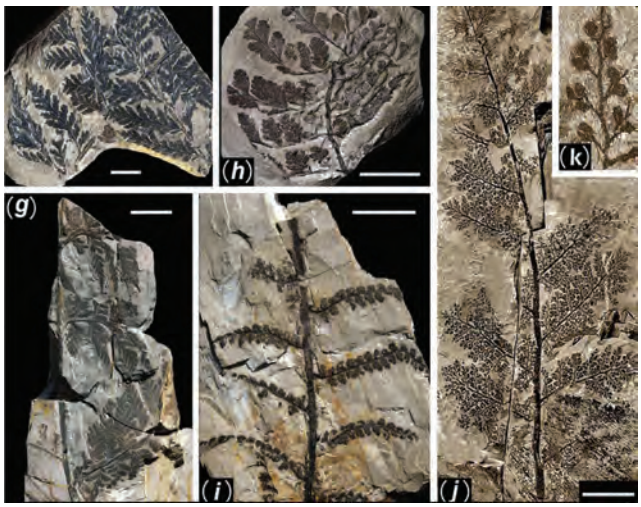
Further Considerations

As I have indicated, there are thirty to forty living cat species, including domesticated cats, all of which biblical literalists believe evolved from a pair of cats on Noah's ark. But there are 150 species of extinct cats, including the saber-toothed tiger. Presumably, a male and female of one of these extinct cats were put on the ark to evolve to the thirty to forty living species. There are five species of rhinos living today and more than 100 extinct species. There are five to forty species of canines and more than 200 extinct species. There are seven species of living horses and 150 extinct species. There are eight species of living bears and sixty-three extinct species. There are seventeen species of living penguins and more than fifty extinct species.[14] Whatever family of animals is selected, there are many, many more extinct species. Of course, one could say God could produce his creation instantaneously, but if God used his natural laws, then it seems illogical that he would be producing instant creations over and over again throughout the geologic column of sedimentary rocks or during biblical times. On that basis, one is forced to come to the conclusion that if God created billions of creatures, he needed much more time than 4,350 years so that these creatures could evolve into the different kinds of animals. He could not have crammed all these creatures into such a short period of time, obey his natural laws, and leave enough time for them to reproduce and evolve to form different species. This realization of a time limitation also means that logically all of the above observations indicate that a worldwide Noah's Flood never happened and that Earth must be more than 6,000 years old, particularly because no cetacean fossils have ever been found with sea reptile fossils.

Plant Species

The diversity of animals through time has been well described, but plants tell us a similar story. In China, plant fossils have been found in an ash layer about a meter thick between two coal layers. This ash layer has been excavated over a large area and carefully mapped to locate where different plants, insects (such as dragon flies), salamanders, and frog fossils were found.[15] Artist images of this ancient forest can be seen in a 2012 paper by Jun Wang and colleagues (Wang et al. 2012).

During some ancient time (for a period of perhaps a week) a nearby volcano exploded in a catastrophic event and sent out hot ash that killed all plant and animal life in this area containing a former forest community. Because this happened and has been examined carefully, a snapshot of what life was like in Permian time, 300 million years ago, has been obtained. An ecosystem of plants, insects, and animals for this particular area in China is revealed. But what is present here is not just a local ecosystem that did not exist any place else, because these same fossils are found in other parts of the world in ash and other rocks of the same age.



Wang et al. 2012; reprinted with permission.

Figure 3.Examples of leaf fossils in China's 298-million-year-old buried forest. (F and G) *Sphenopteris cf. tenuis*; (H) *Sphenopteris* sp. 1; (I) *Sphenopteris* sp. 2 with abnormal pinnule (Aphlebia) at the very base of each.

Volcanic ash is particularly good at preserving plant fossils without any disturbance of how these plants once grew relative to their neighbors. The image of leaf fossils in Figure 3 demonstrates how very delicate leaves can be exquisitely preserved when surrounded and covered by falling ash. In contrast, if these leaves had been deposited in sediments that were transported in rushing water of a tsunami generated during Noah's worldwide flood, they would have become broken and mixed together as unrelated fragments of different plants. Among the plant fossils in China are tree ferns, lycopods (scale trees, *Lepidodendron*, now extinct), cycads, and horsetails. Some former, fully grown, but fallen scale trees that were buried flat in the ash give evidence that these trees sometimes were as much as 100 feet tall. Likely, in this same environment, leaves falling off the scale trees and cycads in this ancient forest settled into swamp water, and the low oxygen content of this water prevented bacterial decay of the leaves so that the leaves accumulated to several feet of thickness. Eventually, this carbon-rich plant material became compressed after deep burial under other sedimentary rocks, and

at higher temperatures and pressures was converted into coal.

Note that the accumulation of leaves that eventually became compressed to form coal is typically a slow process that could not have been expected to occur quickly during the one-year Noah's Flood. Moreover, in the leaf fossil-bearing site in China, there are two separately formed coal beds so that there had to have been a long period of time for the regrowth of a new forest community on top of an older forest community that was killed by the falling hot ash. The time for regrowth must necessarily have been more than a year because to grow 100-foot *Lepidodendron* trees to supply the leaves that later became coal would have taken this greater length of time. Furthermore, in Illinois, there are as many as fifteen different coal seams of Pennsylvania age that are separated from each other by layers of flood-plain muds and river-channel sands, where ancient rivers once eroded through these coal seams in many places.[16] Meandering river channels cannot have been produced by a tsunami created by Noah's supposed worldwide flood. Moreover, the growth of fifteen different *Lepidodendron* forest communities in the Illinois area (Dimichele and Phillips 1985), which are on top of each other, would have each required more than a year to grow the tall trees—again to supply the leaves that later became coal. On that basis, the Pennsylvanian rocks in Illinois, like the Permian rocks in China, cannot have been deposited by Noah's flood that lasted one year, and the flood could not have been worldwide because neither place shows tsunami-like debris.

The diversity of animals through time has been well described, but plants tell us a similar story.

Furthermore, in the Permian rocks that contain the two coal seams in China, there are no fossils of birds, mammals, dinosaurs, flowering plants, or conifers. It is an exotic and a specific type of forest community. Conifers (gymnosperms) did not appear until the late Permian to the early part of the Mesozoic Era (Triassic), and flowering plants (angiosperms) did not appear until late in the Mesozoic Era, in the Cretaceous Period.[17] So, pollen from the conifer and flowering plants are not found in the volcanic ash of early Permian age, which preserved this ancient forest. If these rocks were deposited during Noah's Flood, the conifers and flowering plants should also have been alive at the same time because young-Earth creationists claim that Mesozoic rocks were deposited during this flood, and the winds that blew the ash should also have carried tiny, wafted, pollen grains from living conifers and flowering plants to the site that contains the lycopods and cycads, and that did not happen.

At any rate, volcanic ash is an excellent medium for preserving plant fossils, and because of the preservation of the forest plants in ash in China and in many other places around the world, this worldwide distribution of plant fossils give evidence of a quiet setting that clearly shows that a worldwide Noah's flood never happened. Even though young-Earth creationists believe that the Permian Kaibab limestone formation in the Grand Canyon was deposited by Noah's worldwide flood (Hill et al. 2016), the Permian ash beds in China, containing wonderfully preserved, unbroken, plant-leaf fossils, clearly shows that all the Permian rocks in the world cannot have been deposited by a worldwide flood.

Summary and Conclusions

The following nine observations of biological relationships provide strong evidence that the young-Earth creationists' worldwide flood 4,350 years ago is unsupported and that Earth is far more ancient than they claim if God's natural laws are obeyed.

1. Numbers of species in the geologic record are so large that not enough time could exist for God to create them by evolutionary changes in the DNA coding and for the animals to reproduce to form millions and millions of living creatures in less than 6,000 years and for huge numbers of species to evolve from only pairs of kinds or baramins on Noah's ark in the time following 4,350 years ago to the present.

2. No cetacean fossils (bones of whales, dolphins, and porpoises) in Mesozoic rocks coexist with fossils of sea reptiles, and both animal types must have been living at the same time when Noah's Flood supposedly occurred if the YEC model were correct.[18]

3. Extinct species of animal families far outnumber those living today. This makes it very difficult to have all these species created on Earth in 6,000 years and for many species to have been created after a supposed worldwide Noah's Flood occurred about 4,350 years ago.

4. Too many bird species exist (9,000 to 10,000) for them to have evolved from 169 pairs of birds on Noah's ark or for as many as 10,000 additional extinct species to have evolved from a single pair of birds prior to Noah's Flood in 6,000 years.[19]

5. Too many elephant species (150-plus) exist for them to reproduce and increase to herds of millions and millions of animals in 4,350 years after Noah's Flood and particularly for tens of millions of mammoths to have been created in that short time.

6. Ecosystems of plant, insect, and animal species of Permian age preserved in volcanic ash in China and in other volcanic ash and rocks of the same age in other places around the world (the ecosystem in China is totally undisturbed) indicate that such plant and animal communities could not have been buried in sediment transported by a tsunami generated by a worldwide Noah's Flood.

7. Pollen is not found in the ash in the preserved forest ecosystem in China when wind that blew this ash should have also blown pollen wafted from conifers and flowering plants that must have been alive at the same time, according to the model of the YECs.

8. The growth of a new forest community in China to produce a second, meter-thick, coal seam cannot have been

produced in one year after a former forest community was killed by ash, and, therefore, these Permian rocks cannot have been buried during the supposed worldwide Noah's Flood.

9. The occurrence of fifteen different coal seams in Pennsylvanian rocks in Illinois, which are in sequential layers on top of each other and the time (far more than one year) that it would take for *Lepidodendron* trees to grow to 100-feet to produce the leaves that later convert to coal for each of the fifteen coal seams means that these Pennsylvanian rocks cannot have been deposited in the one year in which Noah's worldwide flood is supposed to have occurred.

Because contemporary young-Earth creationists have said that the Bible must be literally interpreted, they have made all the wrong interpretations listed in the above nine conclusions about animals and plants that were buried in sediments deposited during the supposed worldwide Noah's Flood.

Biological Reasons Consistent with Physical Geologic Reasons

All biological reasons a worldwide Noah's Flood never happened described in this article are consistent with physical geological reasons a worldwide flood never happened, published in my earlier Skeptical Inquirer article (Collins 2018). (See also my follow-up "Response to Ken Ham and YouTube Comments by Andrew Snelling," SI, July/August 2018, pp. 56–58.) They all give the same conclusion: that a worldwide flood never happened and, on the basis of erosion rates in rocks in the Grand Canyon in Arizona, Earth cannot be 6,000 years old (Collins 2018). Nevertheless, a local large flood in biblical times could have happened (Collins 2009). Not included in this article are supporting studies that also indicate that Earth cannot be 6,000 years old.[20] ■

Acknowledgements

I thank Glenn Branch from the National Center for Science Education for many helpful editorial suggestions, Joel Duff from the University of Akron for many useful editorial changes, and Forrest Hopson for several critical comments.

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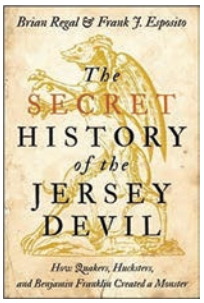
Lorence G. Collins is a retired professor of geology from California State University Northridge with specialties in mineralogy and petrology. He resides in Thousand Oaks, California, and attends the United Methodist Church. He has a website with over forty articles that give arguments against the young-Earth creationists' models (see http://www.csun.edu/~vcgeo005/creation.html). Among these articles are three that describe a bogus ark in eastern Turkey and an article about a false discovery of the cities of Sodom and Gomorrah. He wrote "Twenty-One Reasons Noah's Worldwide Flood Never Happened" in our March/April 2018 issue.

An Early 'Monster' with an Older History

TERENCE HINES



The Secret History of the Jersey Devil. By Brian Regal and Frank J. Esposito. Johns Hopkins University Press, Baltimore, MD, 2018, 147 pp. Hardcover, $24.95; Kindle edition, $23.70.

In cryptozoological terms, the Jersey Devil doesn't have the cachet of the Loch Ness monster, Bigfoot, or even the chupacabra. The Devil is said to live in the New Jersey pine barrens, an isolated and wild area of southern New Jersey covering over one million acres. Despite its remote environment, the Devil does have its own local following, to the extent that the New Jersey professional hockey team was named, in 1982, the New Jersey Devils. The Devil has a much older history than the more famous and worldly cryptozoological creatures. In *The Secret History of the Jersey Devil*, historians Brian Regal and Frank Esposito trace the origins of the Jersey Devil from an eighteenth-century New Jersey settler named Daniel Leeds to the present day.

Leeds came over from England in 1676 as a Quaker, but he left the Friends and became an Anglican. This led to acrimonious relationships between him and his former Quaker brethren. This was especially so when he began publishing an almanac that contained material the Quakers found offensive. As was the style of the time, the opponents on each side called each other "devils" and, when printing techniques were advanced enough, illustrated their screeds with wood block cuts of sort of devil-looking creatures. In Boston in 1638, Anne Hutchinson gave birth to "a disturbing mass that bore little resemblance to a child" (p. 15). Her child was transformed in legend into a monster. In the 1730s in New Jersey, another legend sprang up concerning a witch named "Mother Leeds" who—you guessed it—gave birth to a "hideous beast" that a few years later killed "both parents and head[ed] off into the woods" (p. 5). Perhaps coincidentally, in 1730 Benjamin Franklin published a satirical story titled

The Devil has a much older history than the more famous and worldly cryptozoological creatures.

"A Witch Trial at Mt. Holly" lampooning witch hunting that was set in New Jersey. Regal and Esposito speculate that this story, along with the case of Anne Hutchinson, formed the basis of the Jersey Devil legend.

After Daniel Leeds died, his son Titian took over the almanac business and came into conflict with Benjamin Franklin, a much more famous almanac publisher. In the course of that dispute, Franklin satirically contended that Titian had died and his (Franklin's) verbal jousting partner was the spirit of Titian. This could have reinforced the connection between the Leeds name and something occult. If that was all there was, I wouldn't be writing this review and you wouldn't be reading it. After the end of the eighteenth century, mention of the Jersey Devil pretty much disappeared. The legend cropped up here and there every now and then but had largely faded from public consciousness.

The legend reappeared in the late nineteenth century. It gained new life from eyewitness reports. In an especially dramatic example, a train engineer reported in 1893 that his train had been attacked by a strange flying creature with a monkey-like face. When it was suggested that the witness had misperceived an owl, he of course denied it. But that is certainly a plausible explanation. Regal and Esposito do not mention it, but the misperception of an owl has led to at least one other legend of a monstrous creature, the Mothman (see Joe Nickell's column, Skeptical Inquirer, March/April 2002). In any event, this report was followed by others—not frequently but often enough to generate interest and awareness on the part of the New Jersey public. Then in the winter of 1908–1909 mysterious footprints began to appear in New Jersey. They were said to be those of some unidentified beast.

It was these sorts of reports in the press of the day that, in late 1908, reached the eyes of Norman Jeffries, a promoter who worked for Charles A. Bradenburgh who just happened to own the not-then-doing-so-well "Dime Museum" at Ninth and Arch Streets in Philadelphia. Since in reality there was no Jersey Devil, Bradenburgh, following in the footsteps of P.T. Barnum, simply created one. A live kangaroo played the part. A taxidermist named Hope "painted stripes on the kangaroo and attached a pair of homemade wings to the poor creature." Then "Jeffries hired a

Ringling Brothers Circus clown named George Hartzell and some of his friends to act as monster hunters and go out on an 'expedition' to catch the fiendish beast" (p. 78), which, of course, they did, after much commotion involving guns firing and the hunters screaming. The "monster" was displayed at Bradenburgh's museum and attracted large crowds. It didn't last long, and the kangaroo hoax was soon revealed, but the money had been made. Hoax or not, the Devil was back in the public consciousness, where it has remained to this day. As is the case for various other cryptozoological creatures, the only evidence for the Devil's existence is eyewitness reports. At present there are frequent monster hunting expeditions into the Jersey pine barrens in search of the monster. It will not come as any surprise to the readers of this journal that these expeditions produce eyewitness reports of the Devil.

The Secret History is more than a historical account of the development of the devil legend. The authors integrate the devil legend with two different historical trends. In the last two chapters, they note that seventeenth- and early eighteenth-century tracts often included images of monsters that bore a resemblance to what the Devil is supposed to look like—bipedal creatures with wings and grotesque animal-like heads, often with horns. There is then a discussion of nineteenth-century reports of sea monsters and how these relate to the Devil. Most originally, there is also a discussion of the long-lasting fascination with true medical "monsters"—deformed children and adults—and how these may have informed beliefs about the Devil.

The book is well referenced with citations to works from the sixteenth through the nineteenth centuries as well as citations to relevant newspaper articles from the late nineteenth and early twentieth centuries when the devil legend took on its modern form. If anything disappointed me, it was the discussion of the mysterious footprints in the snow that were sighted throughout New Jersey in the winter of 1908–1909. I'd heard the story of these footprints and hoped that the book would shed some light on what was actually going on: Were they hoaxes, misperceptions of animal tracks, or what? The authors do make reference to the tracks as an important component of the devil legend but go no further. It would have been interesting to read a more detailed account of the original reports of this phenomenon. This said, the book is certainly not credulous when it comes to the Devil. The authors are fully aware of the problems with the type of evidence that cryptozoologists take as proof for nonexistent creatures.

While the Jersey Devil is older than any of its cryptozoological cousins mentioned at the start of this review, it shares many of the same characteristics—belief reinforced by misidentification, hoaxes, and, most recently, commercial firms offering monster hunting tours. It differs in that it has an early history steeped in real events involving real people—one a famous American Founding Father. Regal and Esposito have done an excellent job of telling the story of this creature. ■

Terence Hines is professor of psychology at Pace University and author of *Pseudoscience and the Paranormal.* He is a CSI fellow.

The Case That CAM Is Unethical

HARRIET HALL

Edzard Ernst is arguably the world's foremost expert on the claims and the evidence (or lack thereof) for Complementary and Alternative Medicine (CAM). Now he has teamed up with a medical ethicist, Kevin Smith, to coauthor a new book, *More Harm Than Good? The Moral Maze of Complementary and Alternative Medicine*. Much has been written on CAM, but this book takes a new approach. It asks if CAM is ethical and answers with a resounding "No."

More Harm Than Good? The Moral Maze of Complementary and Alternative Medicine. By Edzard Ernst and Kevin Smith. New York: Springer Publishing, 2018. ISBN 978-3-319-69940-0. 223 pp. Softcover, $22.99.

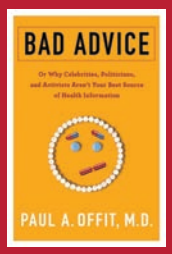
In all areas of health care, patients are entitled to expect certain basic precepts to be satisfied: "Practitioners should be competent. Treatments should be based on valid knowledge. Educational and licensing programs should ensure that only qualified practitioners can practice. Autonomy: patients should be free to choose or reject treatments based on full informed consent. Honesty. Absence of exploitation."

"These basic ethical requirements are frequently neglected, ignored or willfully violated in CAM," the authors say. They address these precepts one by one in great detail, showing how CAM fails to measure up. They support their argument with plentiful examples from the clinical practice of CAM practitioners.

The book begins with a primer on medical ethics. They discuss the frameworks of nonconsequentialism and consequentialism and show how the framework of principlism attempts to factor in both of those approaches, resulting in four core principles: respect for autonomy, nonmaleficence, beneficence, and justice.

[NEW AND NOTABLE

Listing does not preclude future review.



BAD ADVICE: Or Why Celebrities, Politicians, and Activists Aren't Your Best Source of Health Information. Paul A. Offit, MD. Noted physician and vaccinations expert Paul Offit (Children's Hospital of Philadelphia) is on a tear. He's already written worthy books on vaccines, antibiotics, alternative medicine, dietary supplements, megavitamins, faith healing, and scientific discoveries gone awry. Here he looks at how popular culture affects our choices and decisions about health care, not always for the better. Since it's difficult for most people to sort out good studies from bad, they make decisions based on the believability of whoever is doing the talking. Charisma, appearance, and personalities win out over fact and logic. He also hopes people might learn from his journey through the obstacle course that he had to fight, including hostile activists and personal injury lawyers, threats, and lawsuits. Columbia University Press, 2018, 238 pp., $24.95.

SCAM: So-Called Alternative Medicine. Edzard Ernst. Dr. Edzard Ernst may well be the most knowledgeable person in the world about so-called alternative medicine (SCAM). His voluminous published studies and writings examining its dubious claims demolish their validity and deserve our utmost consideration and attention. We welcome this latest book, based on his twenty-five years of research into SCAM. He says it is not written for true believers (who he laments are often unable to change their minds) but for everyone who has an interest in so-called alternative medicine and is open to considering the evidence. It is not a guidebook. It is a compilation of fifty essays about SCAM in more general terms, free of technical language and loosely organized under seven headings and capable, he hopes, of being read independently. It discusses many recently published examples of pseudoscience, misleading information, and SCAM promotion. He calls the book a plea for getting people to think critically about SCAM and healthcare in general. Includes a very useful ten-page glossary. Imprint Academic (distributed in the United States by Ingram Book Company), 2018, 220 pp., £14.95.

SCIENCE NOT SILENCE: Voices from the March for Science Movement. Edited by Stephanie Fine Sasse and Lucky Tran. On April 22, 2017, more than one million people around the world participated in the March for Science. They came from diverse backgrounds and cultures, united with the goal of advocating for the importance of science in society. *Science Not Silence* offers profiles of (and brief interviews with) dozens of marchers, including educators, scientists, schoolchildren, graphic designers, environmentalists, organizers, and at least one giraffe keeper. The book is colorful and heavily illustrated with photographs (mostly people holding science-sloganed signs) and serves as inspirational documentation of the history-making march. The MIT Press, 2018, 176 pp., $14.95.

—Kendrick Frazier and Benjamin Radford

There is an excellent chapter on research fundamentals (what good research should look like). It covers pitfalls in research, p-values, placebo controls, double blinding, systematic analyses, prior probability, and other crucial topics.

The following chapter covers the problems with much of CAM research, focusing on these issues: insufficient numbers of participants, lack of a control group, inappropriate control group, control group present but otherwise flawed, use of surrogate endpoints, misuse of statistics, "too good to be true" results, and fraudulent research.

The authors provide numerous examples of each and speculate about possible reasons for poor research design (perhaps the CAM researchers realize that a properly controlled study would show that their treatment doesn't work). Any study with the design "A + B versus B" will guarantee a positive result, even if A is ineffective. Doing such studies is not only useless but unethical, because it fails to answer a meaningful question and wastes resources.

They explain why anecdotal evidence is woefully inadequate: "Indeed, findings that accrue from this approach are liable to grossly misinform clinical practice; in this way, anecdotal evidence can often be worse than no evidence at all." Much of CAM research is no better than an assemblage of anecdotal cases.

They explain the attraction of CAM, with a quote from Peter Medawar: "If a person is A) poorly, B) receives treatment intended to make him better, and C) gets better, then no power of reasoning known to medical science can convince him that it may not have been the treatment that restored his health."

They argue that certain unavoidable features of CAM education render it an almost intrinsically invalid enterprise. It often resembles a religious cult, and it expropriates and corrupts core concepts from mainstream medicine. Students who enroll are not provided with accurate and sufficient information and can't really give informed consent for their education. Chiropractic schools that teach "subluxation" have to teach a corrupted version of evidence-based medicine, because there is no evidence that subluxation is a valid concept, and there is evidence that chiropractic manipulations can lead to serious injury. Naturopaths, chiropractors, and homeopaths are poorly educated about vaccination; this has an impact on public health.

Informed consent requires the patient to understand the indication for the treatment, the nature of the procedure, the potential benefits and risks, and other treatment options.

A patient with asthma who is treated with spinal manipulation by a chiropractor is not likely to have given informed consent, which would require informing them that there is no evidence that spinal manipulation, and thus chiropractors, have any effect on asthma, that delaying proper conventional treatment is dangerous, that there are risks to spinal manipulation, and that other

(proven) treatment options are available. "The notion that CAM tackles the root causes of disease is a myth and an unethical distraction from the truth. … We cannot name a single alternative treatment for which there is compelling evidence proving that it can produce more than symptom-relief."

Unreliable diagnostic techniques, such as iridology, can generate both false-positive and false-negative results; sometimes false results can cost lives. "In this way invalid diagnostic tests are akin to bogus bomb-detectors."

Genuine informed consent is unattainable for most CAM modalities.

CAM practitioners may peddle untruths for reasons ranging from honest error to deliberate fraud; the consequences to the patient are the same. Falsehoods are always ethically unacceptable. Who should act to fulfill the duty of preventing falsehood-related harm? Individuals, agencies, and the government all share that responsibility.

When confronted with evidence that their CAM modality is not as effective or safe as they claim, CAM practitioners respond predictably, and Ernst and Smith predict these responses to their book:

1. They will state that there is evidence to the contrary.
2. They will suggest that the existing evidence has been misquoted.
3. They will say that medical research is generally so flawed that it cannot be trusted.
4. They will claim that scientific evidence is overruled by centuries of experience.
5. They will reverse the burden of proof.
6. They will say that a new scientific paradigm is required to explain how CAM works.
7. They will claim that scientific evidence and reasoning are not applicable in CAM.
8. They will point out how safe or inexpensive CAM is compared to conventional medicine.
9. They will suggest that the critic is paid by big pharma to defame CAM.
10. They will launch personal attacks on their critics.

To nip this in the bud, the authors have provided rebuttals to each of these arguments. And then they address the argument that even if CAM is only placebo, its use is justifiable.

Finally, they discuss the ways in which CAM exploits patients, including physical damage, mental distress, financial loss, and harm to third parties.

Ernst and Smith make a strong case that CAM is unethical and that it does more harm than good. Ethicists should be convinced. CAM practitioners and patients will not be, because their belief systems preclude an unbiased, rational scientific assessment. They will object as Ernst and Smith have predicted, but their objections have already been handily refuted. This book is well organized and well thought out. It was written to inform, not to entertain. It is not an easy or "fun" read, but it's an important one. ■

Climate Fundamentals: *NOVA*'s 'Decoding the Weather Machine'

David Morrison

NOVA, PBS, "Decoding the Weather Machine," broadcast April 18, 2018, two hours. http://www.pbs.org/video/decoding-the-weather-machine-vgqhot/. DVD available from https://shop.pbs.org/nova-decoding-the-weather-machine-dvd/product/NV61803.

Despite nearly unanimous consensus among climate scientists and increasing evidence for disruption of "normal" weather, a substantial minority of Americans do not accept the reality of human-caused climate change. There have been many discussions of how to bridge this gap in public understanding of climate science. Suggestions include emphasizing fact over theory or models, citing current examples of climate impact, and using spokespersons who are perceived as credible by many audiences.

The new two-hour *NOVA* television documentary "Decoding the Weather Machine" embodies these approaches, starting with a title that focuses on weather, not climate. The opening statement is "Most people sense a change in the weather." The film defines its subject as "Global investigation of our climate machine and how it determines our weather." John Holdren (identified only as affiliated with Harvard University, not former Presidential Science Advisor) ties it all together, with lots of scientist interviews and spectacular images of fieldwork, from the Greenland ice-sheet to coral reefs. Most of the scientists are young and at least half are women, rather than the usual cast of graying male climatologists. Katharine Hayhoe, an excellent climate communicator, plays a prominent role.

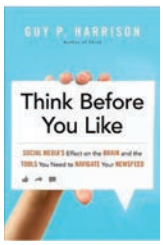
The presentation is logical and factual. Climate models, and predictions of future consequences, are introduced only near the end. It begins with the Keeling curve and ice cores to demonstrate increasing carbon dioxide over the past several millennia, followed by similar treatment for temperature history of the past 800,000 years. The film also clearly explains how isotopic evidence identifies the origin of added CO_2 in burning fossil fuels, not (for example) volcanoes or changing plant cover.

Much of the film discusses the impact of climate change, stressing that half the added energy is going into the oceans, and explains how this heat interacts with ocean circulation. The impacts of sea level rise are shown, including the catastrophic effect on low-lying islands such as U.S. naval ports, including discussion of national defense implications by two U.S. Navy officers. However, the emphasis is on the data, and on evidence that climate change is happening now, with demonstrable impact on ecosystems and people.

NOVA has done an excellent job presenting sober, relevant science. This is a departure from some of their recent over-hyped films, which build to an artificial climax in the last five minutes when some amazing discovery is made on camera. I hope this film reaches that part of the public that has been uncertain or in denial about climate change and its consequences. ■

This Is Your Brain on Social Media

Benjamin Radford



Think Before You Like: Social Media's Effect on the Brain and the Tools You Need to Navigate Your Newsfeed. By Guy P. Harrison. Amherst, NY: Prometheus Books, 2017. ISBN: 978-1633883512. 380 pp. Softcover, $18.00.

The use of social media has risen dramatically in recent years, but our ability to responsibly handle it has not kept pace. Guy Harrison is author of many skeptical books, including *Think: Why You Should Question Everything*; *Good Thinking: What You Need to Know to Be Smarter, Safer, Wealthier, and Wiser*; and *50 Popular Beliefs That People Think Are True*.

In *Think Before You Like*, Harrison examines the ways in which social media reinforce our biases, cloud our judgment, and spawn and perpetuate misinformation. He offers practical advice on media literacy and cyber self-defense, as well as insight into issues of privacy, psychology, and personal identity in the digital age. Chapter 2, "Welcome to Your Very Own Customized, Biased Bubble of Psychological Reinforcement, Manipulation, and Lies," is perhaps the most relevant to skeptics hoping to understand the psychological and social consequences of social media.

As Harrison notes in the introduction:

> This book is neither an endorsement nor a condemnation of social media … . All that can be said with certainty today is that there is an urgent need for all users to arm themselves with knowledge about how social media companies operate, how our brains function online, and what steps we can take to protect ourselves … . The social media arena is a place where millions of human minds are manipulated and steered for someone else's gain. High intelligence or traditional educational accomplishments won't be enough to protect you. There is no place for arrogance here. Those who believe they could never fall for a silly belief already have.

As Harrison's book was going to press, new revelations emerged about the power and misuse of social media, including Russian troll manipulation to influence the 2016 elections and the misuse of Facebook user data by Cambridge Analytica. Harrison's book will only become more timely in the coming years. ■

[LETTERS TO THE EDITOR

E.O. Wilson | Navy Pilot's UFO | William James and Psychics | Flat-Earth Anxieties | Prince Charles
Skeptical Inquirer
PROGRESSOPHOBIA
Why Things Are Better Than You Think They Are
STEVEN PINKER
Trauma and Taboo: Repressed Memories Are Back
Percival Lowell and the Canals of Mars
The Curious Case of Ghost Taxonomy
Theistic Science Is Not Science!

Steven Pinker's 'Progressophobia'

While Steven Pinker is right in asserting that things are much better for humanity today than they were in the past, any assumption that such progress will continue into the future may be based more on hope than on evaluation ("Progressophobia," May/June 2018). Serious problems in the past have often spawned solutions, but for too many contemporary problems, solutions may be difficult or even impractical.

The wise and intelligent use of science has brought humanity to its present decent state, but failure of our intelligentsia and our leadership to understand basic science could be disastrous.

The lack of understanding of the basic principles of science among the educated and our leadership is evident in the popularity of "alternative" medicine and "organic" foods, the opposition to GMO food, and the unsound "precautionary principle" that leads to the distrust of anything with a chemical name. The precautionary principle prohibits any chemical that has been found to be toxic (at any level of dosage) from being used in any food product or household item. This disregards the essential scientific principle that "only the dose makes the poison." Today scientific methods can detect the most minuscule presence of a chemical, far below any toxic dosage, but laws in California based on the precautionary principle prohibit too many important and safe foods and compounds from use, with consequent social and economic damage.

And then there are environmental threats such as global warming and dwindling energy supplies, wars based on religion and nationalism, and the threat of a major nuclear war, with reckless and glory-seeking individuals with a hand on the button.

Major problems have been solved in the past, as Pinker points out. But do today's problems have a working resolution, and, even if they do, does humanity have the scientific wisdom and willingness to achieve a solution?

Dr. Marvin J. Schissel
New York, New York

I don't want to contest Steven Pinker's statistics nor minimize their significance. The piece is brilliantly reasoned and presented. But I don't think he sees the whole picture. An old joke came to mind. In the early 1920s after Lenin had consolidated his power, he sent government spokesmen around the country to give pep talks on the progress and prospects of the new workers' paradise. After the talk in one remote village, an old peasant raised his hand. "Comrade," he forlornly asked, "if everything is so good, why is everything so bad?"

Alinskyite politics, neo-Marxist ideology, postmodern philos-

ophy, New Age religion, multiculturalism, "contemporary morality"—welcome to the twenty-first century, part *1984*, part *Atlas Shrugged*, and the death wish of Western Civilization. I don't believe such modern intellectual dregs are necessary for decreases in war, disease, and poverty; rather, they work toward halting and reversing those felicitous trends and they have robbed us of most of our heritage, our dignity, and our joy.

In young adulthood I was appalled by the attitude of one of my father's friends. "I'm glad I won't live to see the next fifty years," he often solemnly intoned. Now every day I find myself thinking, "I'm glad my parents didn't live to see this." I appreciate being safe, but I hate what the world has become in my lifetime.

Norman Carlson
Busti, New York

I enjoyed Pinker's article. As a medievalist/anthropologist who spends every spare moment reading about everyday people's lives in the past, I *know* things are better now than ever.

Bad as things may seem in the twenty-first century, at least I'm not trying to hide from a horde of Vikings, avoid catching my neighbor's smallpox, or dying of lead or arsenic poisoning from my own skincare routine.

Ruth Dunmire
San Rafael, California

I almost stopped reading Steven Pinker's article after the first two paragraphs, because they ring false in the light of my own experience. I'm glad I changed my mind. The bulk of the article is a spirited, cogent, and evidence-based defense of the Enlightenment concept of progress.

Pinker scolds intellectuals because they despise the Enlightenment. I can't accept his statements, because they directly contradict my long experience. As a university scientist and science teacher, I am well into my seventh decade. I've known thousands of STEM colleagues and students in that time. None ever expressed the views Pinker describes in his opening. Yet, surely, they qualify as intellectuals, engaged as they are in such activities as Bayesian data analysis and integration in the complex plane. I never met one who didn't expect that a deeper view of nature would ultimately lead us all to live longer, healthier, and wiser lives.

Al Holtzer
St. Louis, Missouri

According to Steven Pinker in your issue about "progressophobia," intellectuals, particularly progressive intellectuals, hate progress. This article made me think about the progress that I have seen in my life of seventy-plus years. What comes to mind about progress are things such as environmental protection, civil rights, Medicare, minimum wage, mass higher education, and food assistance. The activists who promoted such progress were exactly the intellectuals of that time, particularly the progressive intellectuals.

An advantage of being old is the perspective I have, having seen both good times and bad. The situation now is worse than any I have seen in my lifetime. Telling people how good things really are may make some people happy. But the same goes for telling people that heaven is real and that prayer will make them healthy and wealthy. If Professor Pinker takes off his rose-colored glasses he will see what is really going on in the world.

John Grant
Baltimore, Maryland

The best rebuttal to Professor Pinker's article "Progressophobia" comes earlier in your same May/June edition. Craig A. Foster, in "Flat-Earth Anxieties Reflect Misplaced Priorities" says, "Humans have a well-known tendency to view the future with unrealistic optimism." I subscribe to Enlightenment ideals, and I've been a major beneficiary of progress. Born a middle-class white American male in the mid-twentieth century, my life has been safer and healthier and I've had more opportunities than almost anyone else in history. But Professor Pinker ignores at least three circumstances that make realistic optimism impossible.

One, of course, is the possibility of nuclear war. I have lived all my life under the threat of nuclear holocaust and in recent years it has become more likely. More nations now have nukes and the United States and Russia are both spending billions to "modernize" their arsenals. This is not progress.

The massive disruption caused by climate change is not just a possibility but a current reality. Even if we take strenuous measures now, the result will be disruption that kills billions (yes, billions) and leaves a much impoverished planet for my children and grandchildren. This is not progress. In addition, many nations are sliding toward fascism, which will only increase tensions and the possibility of war and decrease the possibility that Enlightenment values will succeed. This is not progress.

If I looked only at my immediate circumstances I would be an optimist, but since I know what's going on in the rest of the world, I must be a pessimist.

John Powell
McFarland, Wisconsin

Well, I guess I'm one of Pinker's "chattering class" who hates progress, because I think that our world is facing challenging obstacles ignored by Pinker in his SI article. Those obstacles are the inexorable population growth of 83 million new annual humans adding to the current world population of 7.6 billion and the inexorable increase in carbon parts per million standing at 410 parts per million as recently reported by NASA. The 83 million additional humans will further reduce Earth's nonrenewable resources, and the increase in carbon per million will result in the increasing impacts of global climate change. It seems that science has been unable to deal with either of these issues.

Pinker's article wades into massively detailed arguments concerning violence and the inability of most of us to recognize progress when it is occurring. However, Pinker has avoided dealing with the issues of climate change and population growth (at least in that article), which many believe are compelling issues.

Howard A. Pellett
Anacortes, Washington

I greatly enjoyed Steven Pinker's "Progressophobia" article.

Pinker supports his thesis mostly with facts about the level of violence going down. However, there is another fact missing from the article that also supports Pinker's thesis: more people are making their living from artistic pursuits than at any point in history. I do not need a scientific survey to be certain this is a fact.

Music, movies, television, radio, books, and the graphic arts are employing millions of people, and these industries are doing this without the need for a noble patron as in past eras. To be sure a lot of the artistic output is annoyingly banal, but I take comfort in the fact that the world is running well enough to support the sheer volume of it all.

David A. Dugle
San Pedro, California

Steven Pinker replies:

I share the letter writers' concerns about the threats facing humanity, and like them (and every reader of Skeptical Inquirer*), I deplore reasoning from anecdote and intuition rather than data and science. But many of their objections are rooted in just such fallacies: they assess the state of the world from headlines and nostalgia rather than comprehensive global and historical data.*

Marvin Schissel is surely right to deplore the defiance of the scientific consensus among politicians and laypeople. But as I show in the "Reason" chapter of Enlightenment Now*, it cannot be blamed on a misunderstanding of basic science. Surveys show that creationists and climate-change deniers are as scientifically sophisticated as those who accept the scientific consensus; what differentiates them is their commitment to evangelical Christianity and right-wing politics. The problem is not scientific illiteracy*

but religious and political ideology. And I certainly agree that we have no guarantee that humanity will solve the formidable problems facing it. But the starting point is to recognize that humanity has *solved many problems, even while creating others. Schissel's warning about "dwindling energy supplies" is a souvenir of the Jimmy Carter era; energy supplies today are all too abundant, which is precisely why global warming is such a threat. Our challenge is to apply the same kind of ingenuity that unlocked new sources of hydrocarbon energy to unlock new sources of carbon-free energy.*

Norman Carlson and John Grant fail to notice the irony in replicating the pessimism of their parents' generation: that it may be a sign of their getting older, not the world getting worse. The world of fifty years ago for which they are apparently nostalgic was one in which half of Europe lived under Soviet totalitarianism; China was terrorized by Mao; Spain, Portugal, and most of Latin America and East Asia were ruled by fascist or military dictatorships; we lived in fear of a Soviet invasion of Western Europe and an all-out nuclear attack on America; the Vietnam war killed a quarter of a million soldiers and even more civilians; Richard Nixon was elected president; George Wallace won five states; women were confined to the kitchen; homosexuality was illegal; African American inner cities were in flames; newborns were expected to live to fifty-eight (today they will live to seventy-one); barely more than half the world was literate (today 83 percent are); and half lived in extreme poverty (today 10 percent do). And I thank Ruth Dunmire for reminding us that earlier centuries may have been even worse!

Al Holtzer is correct that my mischievous remarks about "intellectuals" do not apply to most scientists and engineers. They were mainly aimed at C.P. Snow's "Second Culture" of cultural critics, literary lions, erudite essayists, and pontificating pundits.

I share John Powell's concern about the threat of a nuclear catastrophe, but he gives no reason to believe that it has gotten worse since the Cold War, when the world had more than six times as many nuclear weapons and more frequent false alarms and Defcon alerts. His lament about nations "sliding toward fascism" is similarly hyperbolic: these are awful developments, but they do not represent a long-term global trend. The lament ignores that many nations have been sliding toward democracy, and it forgets how many nations really were *fascist and autocratic not so long ago. As I note in the book, in 1971 the world had thirty-one democracies; in 1989, fifty-two; eighty-seven in 2009; and 103 in 2015: more than half the world's nations, governing more than half its people.*

Lowell and the Martian Canals

Thanks to Matthew J. Sharps for his excellent article, "Percival Lowell and the Canals of Mars" in the May/June 2018 Skeptical Inquirer. Many older readers may remember, as I do, the time in their youth when they waited excitedly for news from Mariner.

In "Percival Lowell and the Canals of Mars" *(British Journal of Medical Psychology* 37: 33–4, 1964), Charles K. Hofling notes that Lowell did not see the canals with the 24" telescope, but rather only with a smaller scope of 6". Failing to see the canals with the big scope, Lowell returned to Boston and was diagnosed with neurasthenia. Regarding Lowell's preference for smaller scopes, Hofling writes:

> Habitually working at or just beyond the resolving power of his instruments, Lowell was setting up conditions not dissimilar to those used in modern projective psychological tests, such as the Rorschach or Thematic Apperception, under which unconscious forces are given the maximum opportunity to exert effects upon perception and interpretation.

Hofling notes that Lowell speculated that Martians were older, stronger, and larger than human beings, speculations Hofling thought reminiscent of a child's image of parents. And Hofling noted that Lowell imagined Mars having "a precious fluid being pumped through tubes, making the planet fertile."

As Dr. Sharps writes, "The precise influences on Lowell's thinking cannot now be ascertained," but I'd like to highlight contributions not only from Gestalt psychology but from psychoanalysis as well.

> John Jacobs, MD
> Manchester, New Hampshire

I enjoyed Matthew Sharps's article in the May/June issue of Skeptical Inquirer on the psychology behind Percival Lowell's Martian canals. In addition to the aspect of people seeing what they wanted to see, I'm surprised that I have never seen mentioned by him or other writers the probable dimensions of the *canali* if they existed as drawn. Lowell did not seem to discourage the interpretation of lay people of the day that they were water canals built by Martians for transportation or similar purpose. Such a notion could have been easily dispelled even by a grade schooler on Earth who could quickly calculate that the canals would have to be impractically wide to be seen from such a long distance, and thus impractical for such a use.

> Raoul Drapeau
> Ashburn, Virginia

One of the features of a well-written essay is that it stimulates readers to take the lessons they have learned and apply them to other fields. Sharps's punchline was that observers psychologically interpret what they see. They also see what they are expected or what they hope to see. It was the child without predisposing expectations or psychological factors who cried out that the "Emperor has no clothes." Apply that child's innocent perspective to, say, the existence of the Christian god. We find the same phenomenon of people who "see" their god because they want to. Here people handle their cognitive dissonance by hunkering down, stubbornly clinging to their *a priori* beliefs in the absence of evidence or even in the face of good counter-evidence. But if you go back to the child's point of view, what do you see? Nothing. Nothing at all. Where is the evidence? Evidence? We have faith. We don't need evidence. Yeah, sure.

> Peter G. Roode
> Gainesville, Florida

Matthew J. Sharps's piece on Percival Lowell and his imagined canals of Mars was interesting, but he commits one egregious error: he says "the Mariner spacecraft thoroughly photographed Mars in 1964" and later refers to it as "the Mariner orbiter." The first successful Mariner mission to Mars, Mariner 4, did indeed launch in 1964 but did not arrive until 1965, when it took a mere twenty-two rather grainy photographs as it flew past without going into orbit. The first Mariner orbiter (there were two more flyby missions in 1969) was Mariner 9 in 1971, which did indeed thoroughly photograph Mars (7,329 photographs in all) though not until 1972 due to having to wait several months for a planet-wide dust storm to clear.

> Kevin W. Park
> Greenbelt, Maryland

Matthew Sharps replies:

Mr. Drapeau and Mr. Roode make interesting points. Actually, Lowell didn't just fail to discourage the engineered-system interpretation; he encouraged it quite substantially in his own writings. With regard to the other issue addressed by Drapeau, concerning the width of the canals, the entire point is still somewhat obscure. Given the necessary brevity of the article, I of course had to pick and choose among various factors in Lowell's work, and this is one point that didn't make it into the manuscript. But Drapeau is entirely correct that this rather weird dimensional factor has usually been treated very briefly if at all, even in book-length treatments

of Lowell's life and work. Lowell actually disagreed with practically everybody on the threshold of visibility for his canali*, going with a massively narrower threshold of observation than anyone else seems to have taken seriously. Reading between the lines—a practice which is of course dangerous—I suspect that Lowell may have thought that more experienced observers, like himself, would be able to make out smaller features. Such an argument really doesn't make much objective sense, but Lowell had great faith in his observational abilities and in his interpretations.*

I think we can see a similar example of Lowell's responses to criticism in his assertion of the desirability of small-aperture telescopes for Martian surface observation, as Dr. Jacobs's letter points out, rather than the large-aperture telescopes in which the famed canali *tended to disappear for practically everybody except Lowell. I suspect that the observation threshold issue has not been covered in depth in longer accounts simply because it is very hard to explain except in terms of psychological issues, the focus of the SI article; in my opinion, this points even more strongly to the importance of cognitive and other psychological factors in scientific observation and interpretation, as also emphasized by Roode's observations.*

I thank Kevin Park for the clarifications about the various Mariner missions. The Mariner 4 mission of 1964 (the launch date) was of course a fly-by, not an orbital mission. On page 43, I referred to Mariner 4 as a spacecraft, but to my chagrin I find that I used the word "orbiter" a few paragraphs later. This was an inadvertent holdover from the language of an earlier, much longer draft of this article, which discussed facets of other Mars Mariner missions, including Mariners 6 and 7, which didn't turn up any canals either, and the orbiters (Mariner 8, destroyed, and Mariner 9, which is inactive but still up there at the moment). I should have caught it, but the wrong word was left in place. I regret the error.

Mariner 4's "mere twenty-two rather grainy photographs" were certainly not up to the standards of today's rather miraculous imaging technology. However, by the standards of the pioneering days of the dawn of the space age, they were scientific marvels, the first detailed, close-up images of the surface of another planet. The Mariner 4 survey was as thorough as possible by the technological standards of its day, and it didn't find a hint of Lowell's canals—yet people continued to believe.

Trauma and Taboo

Dr. Stern makes an astute and crucial point in suggesting that exaggerations in the field of sexual abuse may stem from moral outrage over the breaking of a taboo. This outrage may hinder an objective assessment. In revisiting the "Memory Wars of the 1980s and 1990s," Stern criticizes those who advocated the concept of repressed memory, those who allegedly exaggerated the connection between abuse and many forms of psychopathology, and those who contributed to the proliferation of iatrogenic cases of "multiple personality disorder."

It is my view, however, that during the "Memory Wars" there was bias on both sides. A probable bias on the part of some skeptics may also have been fueled by anger and indignation over injustice. Victims of false memory accusations at times were sent to jail and/or their careers and families ruined. Therapists egregiously failed their clients by inadvertently inducing false memories or iatrogenic disorders. This was outrageous. But the moral outrage and sense of injustice on the part of some skeptics may have led to exaggerated claims and a failure to adequately consider data inconsistent with their views. It was declared that there were no corroborated cases of recovered repressed memory and that there is no scientific evidence for the concept of repression. As I had pointed out in a 1996 article in *The Psychological Record* ("Repressed Memories: True and False" 46, 563–579), there actually have been corroborated cases of probable recovered repressed memory, and there actually has been some experimental support for the existence of repressive defenses and the unconscious processing of information. Being a skeptic does not render one immune from the same biases that affect the people whom we criticize.

Andrew D. Reisner
Cambridge, Ohio

Robert Stern replies:

I have criticized, do criticize, and will continue to criticize those who advocate the concept of repressed memory, those who allegedly exaggerate the connection between abuse and many forms of psychopathology, and those who contribute to the proliferation of iatrogenic cases of multiple personality disorder. Guilty as charged and proud of it. In fact, I'd question the ethics and morals of anyone who didn't do so. The alleged exaggerations linking abuse to psychopathology are facts, not allegations. Reisner admits that therapists may have egregiously failed their clients; however, their failures were certainly not inadvertent as claimed—a few embarrassing outliers. The sole purpose of RMT was to uncover the repressed (sexual) abuses that were causing the patient's current problems. After more than a century, evidence of Freudian repression still eludes memory research.

Everyone has biases. That's not necessarily a bad thing. I'm biased toward the better evidence.

Prince Charles's Harm and Gullibility

How important to approach the subject of ridiculous pronouncements by prominent persons, whether royalty, top politicians, or "stars" of entertainment or TV (Edzard Ernst, "Why Did We Call Prince Charles Foolish and Immoral?" May/June 2018).

I was born in Ireland not long after it gained freedom for the Hanoverians and their predecessors after about 350 years. A sign near the entrance to a building in Dublin was posted with the message, NO PARKING HERE. It had been carefully altered to express a republican viewpoint: NO KING HERE. I think Dr. Ernst (and many others) might have appreciated that.

So glad you published this!

John Pearson
Sacramento, California

On Canceling One's Subscription

I think people who indignantly cancel their subscriptions because they have an issue with a certain article (Bowlin letter on "A Skeptics Guide to Racism," May/June 2018) have not yet fully embraced the concepts of open-mindedness or skepticism, and they are still letting their emotions rule over their more rational side.

By canceling one of their best sources for skeptical thinking, they opt to leave themselves in the dark. However, they will find no bliss in their self-imposed ignorance.

Jeff Greif
Elmira, Oregon

[FEEDBACK

The letters column is a forum on matters raised in previous issues. **Letters should be no longer than 225 words**. Due to the volume of letters we receive, not all can be published. Send letters as email text (not attachments) to letters@csicop.org. In the subject line, provide your surname and informative identification, e.g.: "Smith Letter on Jones evolution article." Include your name and address at the end of the letter. You may also mail your letter to the editor to 944 Deer Dr. NE, Albuquerque, NM 87122.

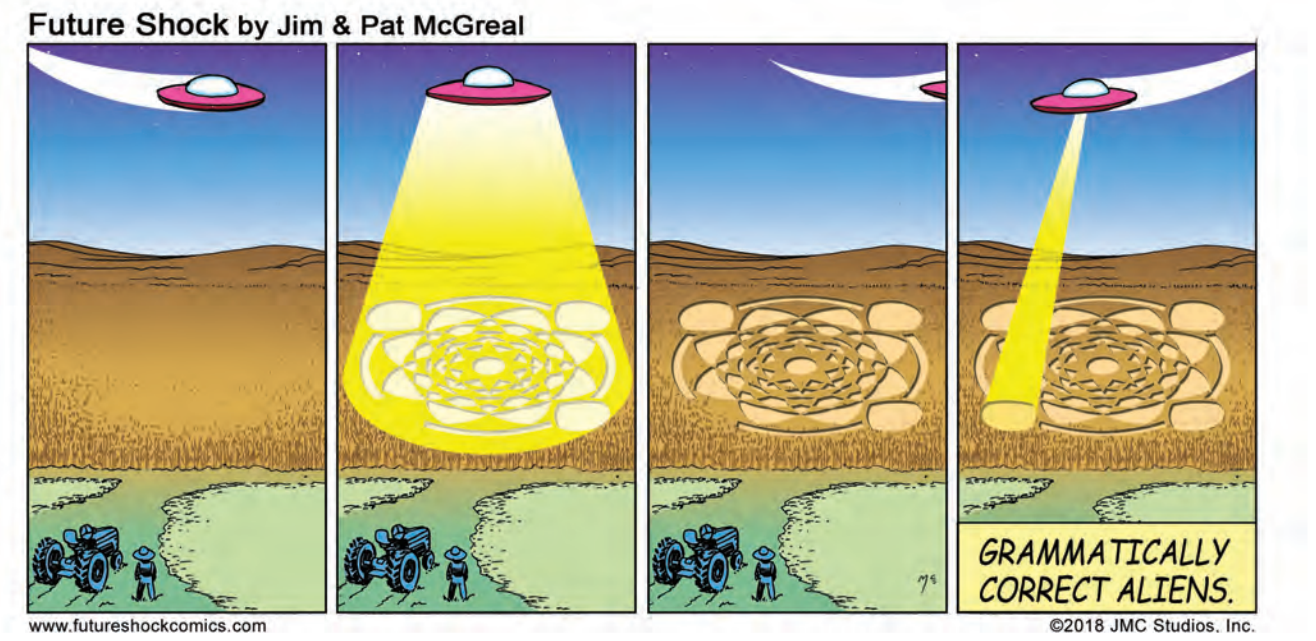
CRYPTOZOOLOGY 101:

THE ACADEMICS HAVE A POINT, AND YET ONCE AGAIN THEY MISS A MUCH LARGER ONE

By David Clewell

If there are really creatures out there in the woods
that have largely succeeded in ducking us for thousands of years,
we'd be better off bumping into any of them
one at a time. That way, we might know what
to call it: *I saw, you saw, we saw Bigfoot*.
Two or more, and it's anybody's guess: *Bigfoot, Bigfoots,*
Bigfeet were watching—a nomenclature nightmare,
and the tabloids as usual are no help at all:
I WAS RAISED BY A TRIBE OF BIGFEET!!
BIGFOOTS PLANNING WORLD DOMINATION!!
BIGFOOT CLAIM THEY'VE BEEN MISUNDERSTOOD!!
I HAD, YOU HAD, WE HAD A LONELY BIGFOOT'S LOVE-CHILD!!

David Clewell is a skeptic, author, and former Poet Laureate of Missouri. This poem originally appeared in *Almost Nothing to Be Scared Of* (University of Wisconsin Press, 2016).



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The organizations listed above have aims similar to those of the Committee for Skeptical Inquiry but are independent and autonomous. Representatives of these organizations cannot speak on behalf of CSI. Please send updates to Barry Karr, P.O. Box 703, Amherst NY 14226-0703.
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